Notice No.4

Rules and Regulations for the Classification of Offshore Units July 2017

The status of this Rule set is amended as shown and is now to be read in conjunction with this and prior Notices. Any corrigenda included in the Notice are effective immediately.

Please note that corrigenda amends to paragraphs, Tables and Figures are not shown in their entirety.

Issue date: June 2018

Amendments to	**Effective date**	**IACs/IMO implementation (if applicable)**
Part 1, Chapter 2, Section 3	1 July 2018	N/A
Part 1, Chapter 3, Sections 1, 2, 4, 5, 6, 22 & 23	1 July 2018	N/A
Part 3, Chapter 1, Sections 2, 6 & 8	1 July 2018	N/A
Part 3, Chapter 2, Section 1	1 July 2018	N/A
Part 3, Chapter 4, Section 1	1 July 2018	N/A
Part 3, Chapter 7, Sections 10 & 11	1 July 2018	N/A
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Part 3, Chapter 16, Section 1	1 July 2018	N/A
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Part 4, Chapter 2, Section 2	1 July 2018	N/A
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Part 4, Chapter 5, Section 5	1 July 2018	N/A
Part 4, Chapter 6, Section 9	1 July 2018	N/A
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Part 4, Chapter 9, Section 1	1 July 2018	N/A
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Part 5, Chapter 1, Section 4	1 July 2018	N/A
Part 5, Chapter 13, Section 5	1 July 2018	N/A
Part 5, Chapter 23, Section 3	1 July 2018	N/A
Part 5, Chapter 24, Sections 1, 2, 3 & 5	1 July 2018	N/A
Part 5, Chapter 25, Section 1	1 July 2018	N/A
Part 10, Chapter 1, Sections 8 & 10	1 July 2018	N/A
Part 10, Chapter 3, Sections 1, 2 & 6	1 July 2018	N/A
Part 11, Chapter 8, Section 1	1 July 2018	N/A
Part 12, Chapter 2, Sections 8, 16 & 35	1 July 2018	N/A

Part 1, Chapter 2
Classification Regulations

■ *Section 3*
Surveys - General

3.5 Existing installations – Periodical Surveys

3.5.3 The Owner should notify LR whenever a unit can be examined in dry dock or on a slipway. A minimum of two ~~Docking~~ Bottom Surveys are to be held in each five-year Special Survey period and the maximum interval between successive ~~Docking~~ Bottom Surveys is not to exceed three years. A Bottom Survey is an examination of the outside of the units's bottom and related items and is normally to be carried out with the unit in dry-dock. ~~The~~ However, the Classification Committee may give consideration to alternate examination while the unit is afloat ~~will accept In-Water Surveys in lieu of~~ ~~Docking~~ ~~Surveys~~ on units assigned an **OIWS** (In-Water Survey) notation, *see Pt 1, Ch 3, 4.3 In-water surveys*.

3.5.4 One of the two ~~Docking Surveys~~ ~~or In-Water Surveys in lieu of Docking Surveys~~ Bottom Surveys required in each five-year period is to coincide with the Special Survey~~, *see Pt 1, Ch 2, 3.5 Existing installations – Periodical Surveys 3.5.3*~~. A Bottom Survey is considered to coincide with the Special Survey when held within the 15 months prior to the due date of the Special Survey. Consideration may be given in exceptional circumstances to an extension of this interval not exceeding three months beyond the due date. In this context ‘exceptional circumstances’ means unavailability of dry-docking facilities, repair facilities, essential materials, equipment or spare parts or delays incurred by action taken to avoid severe weather conditions.

3.5.5 The date of the last Bottom ~~examination in dry-dock~~ ~~or In-Water~~ Survey will be recorded on the Class Direct website.

3.5.6 Attention is to be given to all relevant statutory requirements of the National Authority~~/Coastal State Authority in the country in which the unit is registered and/or is to operate~~ of the country in which the unit is registered and the Coastal State Authority in which the unit operates.

Existing paragraph 3.5.7 has been deleted.

Existing paragraphs 3.5.8 to 3.5.11 have been renumbered 3.5.7 to 3.5.10.

~~3.5.12~~ 3.5.11 The Owner is to prepare a planned survey programme for the inspection of the hull/structure after each Special Survey, before the next Annual Survey is due. The survey programme is to cover the requirements for Annual Surveys, Intermediate Surveys, Special Periodical Surveys, Special Continuous Surveys~~, Docking~~ and Bottom Surveys (in dry dock and in-water) ~~In-Water Surveys in lieu of~~ ~~Docking~~ ~~Surveys~~ and is to be submitted to LR for review. A copy is to be kept on board and made available to the Surveyor. The survey programme should include plans, etc., for identifying the areas to be surveyed, the extent of hull cleaning, locations for non-destructive examination (including NDE methods), nomenclature, and methods for the recording of any damage or deterioration found. The planned survey programme, as agreed by LR, will be subject to revision if it is found to be necessary at subsequent surveys, or when required by the Surveyor. *See Pt 1, Ch 3, 1.6 Planned survey programme*.

Part 1, Chapter 3
Periodical Survey Regulations

■ *Section 1*
General

1.1 Frequency of surveys

(Part only shown)
1.1.1 The requirements of this Chapter are applicable to the Periodical Surveys set out in *Pt 1, Ch 2, 3.5 Existing installations – Periodical Surveys*. Except as amended at the discretion of the Classification Committee, the periods between such surveys are as follows:
(c) ~~Docking Surveys and In-water Surveys~~ Bottom Surveys as required by *Pt 1, Ch 2, 3.5 Existing installations – Periodical Surveys 3.5.3* and *Pt 1, Ch 2, 3.5 Existing installations – Periodical Surveys 3.5.4*.

■ *Section 2*
Annual Surveys – Hull and machinery requirements

2.8 Sea Water Desalination Plants and Fresh Water Systems

2.8.4 Records of potable water quality are to be maintained and are to be made available to the Surveyor on request. These are to include results of analyses made by an accredited laboratory to confirm that the water quality meets that defined in *Pt 5, Ch 26, 1.1 Definitions 1.1.1(b)* ~~the World Health Organisation's *Guidelines for Drinking Water Quality*~~.

■ *Section 4*
~~Docking Surveys~~ Bottom Surveys – In dry dock and In-water ~~Surveys~~ – Hull and machinery requirements

4.1 General

4.1.1 At ~~Docking Surveys~~ Bottom Surveys, ~~or In-Water Surveys in lieu of Docking Surveys~~ the Surveyor is to examine the unit and machinery, so far as necessary and practicable, in order to be satisfied as to the general condition, *see also Pt 1, Ch 2, 3.5 Existing installations –Periodical Surveys 3.5.3*.

4.2 ~~Docking surveys~~ Bottom surveys in dry dock

4.2.1 Where a unit is in dry dock or on a slipway, it is to be placed on blocks of sufficient height, and proper staging is to be erected as may be necessary, for the examination of the shell, including bottom and bow plating, keel, sponsons and appendages, stern, sternframe and rudder. ~~The rudder is to be lifted for examination of the pintles if considered necessary by the Surveyor.~~

4.2.3 For self-elevating units, at each ~~Docking~~ Bottom Survey ~~or In-Water Survey~~ in dry-dock coinciding with Special Survey, the Surveyor is to be satisfied with the internal condition of the leg footings or mats. Leg connections to leg pads are to be non-destructively tested. Non-destructive testing may be required of areas considered to be critical or found to be suspect by the Surveyor. Non-metallic expansion pieces in the main seawater cooling and circulating systems are to be examined both externally and internally.

4.2.7 Visible parts of the rudder, rudder pintles, rudder stocks and couplings and stern frame are to be examined. The pintles are to be examined either by removal of the inspection plates, or if considered necessary by the Surveyor, the rudder is to be lifted to enable examination. The clearances in the rudder bearings are to be measured. The securing of rudder couplings and/or pintle fastenings is to be confirmed. Where applicable, pressure testing of the rudder may be required if deemed necessary by the Surveyor.

4.2.8 The sea chests, sea connections and overboard discharge valves and cocks and their attachments to the hull are to be examined.

4.2.9 ~~Thrusters, propeller, sternbush and sea connection fastenings and the gratings at the sea inlets are to be examined.~~ Visible parts of the propeller(s) and sternbush(es), are to be examined. The clearance in the sternbush and the efficiency of the oil gland, if fitted, are to be ascertained and recorded. For controllable pitch propellers, the Surveyor is to be satisfied with the fastenings and tightness of hub and blade sealing.

Existing paragraph 4.2.10 has been deleted.

~~4.2.11~~ 4.2.10 When chain cables are ranged, the anchors and cables are to be examined by the Surveyor, *see also Pt 1, Ch 3, 5.3 Examination and testing.* ~~For units having a positional mooring notation in accordance with *Pt 3, Ch 10 Positional Mooring Systems*, the positional mooring systems and associated equipment are also to be examined.~~

~~4.2.12~~ 4.2.11 For electrical equipment survey requirements of units five years old and over, *see Pt 1, Ch 3, 9.2 Complete Surveys ~~9.2.13~~*.

Existing paragraph 4.2.12 has been renumbered 4.2.11.

4.2.12 Where the anti-fouling system is changed completely, or partial repair is carried out affecting 25 per cent or more of the system, the coating specification and anti-fouling system is to be examined by the Surveyor in accordance with the *AFS - International Convention on the Control of Harmful Anti-Fouling Systems on Ships, 2001* (AFS 2001) and *Ch 15 Corrosion Prevention* of the Rules for Materials.

4.2.13 Where a unit has an ***OIWS** notation, at completion of each dry-docking in order that the ***OIWS** notation can be maintained, the condition of the high resistance paint is to be confirmed and, as applicable, satisfactory access arrangements to take the sternbush clearance and rudder pintle / bearing clearances are to be verified.

4.3 ~~In-water~~ In-Water surveys

4.3.1 The Classification Committee will accept a Bottom Survey afloat otherwise know as an In-Water Survey ~~in lieu of the intermediate docking survey between Special Surveys~~ at alternate Bottom Surveys on units other than those where an **OIWS** notation is assigned, *see Pt 1, Ch 2, 2.4 Class notations (hull/structure) 2.4.13*, where suitable protection is applied to the underwater portion of the hull and provided the information in paragraphs *Pt 1, Ch 3, 4.3 In-Water surveys 4.3.3*~~.~~ and *Pt 1, Ch 3, 4.3 In-Water surveys 4.3.4* are complied with.
Note statutory regulations *(SOLAS - International Convention for the Safety of Life at Sea* and *2009 MODU Code - Code for the Construction and Equipment of Mobile Offshore Drilling Units, 2009 – Resolution A.1023926))* regarding the requirements for In-Water Surveys at intermediate and Special Surveys shall also apply where applicable.

4.3.3 Special consideration shall be given to ascertaining rudder bearing clearances and sternbush clearances, based on a review of the operating history, onboard testing and stern bearing oil analysis. These considerations are to be included in the proposals, *see ~~4.3.5~~ Pt 1, Ch 3, 4.3 In-Water surveys 4.3.5*.

4.3.4 The In-Water Survey is to provide the information normally obtained from the ~~Docking Survey,~~ Bottom Survey in dry-dock, so far as practicable. For oil-lubricated sternbush arrangements the clearance in the sternbush is not required to be ascertained subject to the Surveyor confirming satisfactory operating history and condition data records (lubricating oil analysis, bearing temperature, lubricating oil consumption) and verifying satisfactory operation of the screwshaft.

4.3.5 When there is no access, special consideration shall be given to ascertaining rudder bearing clearances and sternbush clearances of water-lubricated bearings based on a review of the operating history, on board testing and stern bearing condition data. These considerations are to be included in the proposals for In-Water Surveys which are to be submitted in advance of the survey being required, so that satisfactory arrangements can be agreed with LR.

Existing paragraphs 4.3.5 and 4.3.6 have been renumbered 4.3.6 and 4.3.7.

~~4.3.7~~ 4.3.8 The ~~In-water~~ In-Water Survey is to be carried out at an agreed geographical location, with the Surveyor to LR satisfied that the unit at a suitable draught and the conditions satisfactory for diver or ROV inspection. The ~~In-water~~ In-Water visibility is to be good and the hull below the waterline is to be clean. The Surveyor is to be satisfied that the method of pictorial presentation is satisfactory. There is to be good two-way communication between the Surveyor and the diver/ROV operator. The Surveyor is to be satisfied with the methods of orientation of the divers on the plating, which should make use where necessary of permanent markings on the plating at selected points. The Survey is to be witnessed by the Surveyor. This requires the Surveyor to be on board while the Survey is carried out, to the extent necessary to control the process. The Surveyor may extend the scope of Survey if deemed necessary.

4.3.9 Prior to commencing the In-Water Survey, the equipment and procedures for both observing and reporting the survey are to be agreed between the Owners, the Surveyor and the diving firm.

Existing paragraphs 4.3.8 to 4.3.10 have been renumbered 4.3.10 to 4.3.12.

~~4.3.8~~ 4.3.10 In general, the ~~In-water~~ In-Water Survey is to be carried out using LR approved diving company with suitably qualified divers. Alternatively, the ~~In-water~~ In-Water Survey may be carried out using a LR approved ROV operator, subject to agreement with the attending LR Surveyor.

~~4.3.9~~ 4.3.11 The efficient condition of the cathodic protection system and the high resistance paint is to be confirmed at each ~~In-water~~ In-Water Survey to the satisfaction of the Surveyors, in order that the **OIWS** notation can be maintained.

~~4.3.10~~ 4.3.12 If the ~~In-water~~ In-Water Survey reveals damage or deterioration that requires early attention, the Surveyor may require that the unit be dry-docked, in order that a more detailed survey can be undertaken and the necessary work carried out.

Existing paragraph 4.1.11 has been renumbered 4.3.13.

~~4.3.12~~ 4.3.14 Turret and bearings below water level, underwater parts of mooring towers and/or articulated towers (where applicable), chain stoppers, chain cables and mooring lines/chains are to be examined as far as practicable during ~~In-water~~ In-Water Surveys. On tension-leg units, tethers and their upper and lower connections are to be examined.

Existing paragraphs 4.3.13 to 4.3.15 have been renumbered 4.3.15 to 4.3.17.

■ *Section 5*
Special Survey – Hull requirements

5.1 General

5.1.5 A ~~Docking Survey~~ Bottom Survey ~~or an In-water Survey in lieu of a Docking Survey ,~~ in accordance with the requirements of *Pt 1, Ch 3, 4 ~~Docking Surveys~~ Bottom Surveys - In dry-dock and In-water ~~Surveys~~ – Hull and machinery requirements* is to be carried out as part of the Special Survey.

■ *Section 6*
Machinery Surveys – General requirements

6.1 Annual, Intermediate, Docking and In-water Surveys

6.1.1 For Annual, Intermediate, ~~Docking~~ and ~~In-water~~ Bottom Surveys , *see Pt 1, Ch 3, 2 Annual Surveys – Hull and machinery requirements*, *Pt 1, Ch 3, 3 Intermediate Surveys – Hull and machinery requirements* and *Pt 1, Ch 3, 4 ~~Docking Surveys~~ Bottom Surveys - In dry-dock and In-water ~~Surveys –~~ - Hull and machinery requirements.*

■ *Section 22*
Oxy-acetylene Welding and Cutting Plants

22.1 Frequency of surveys

22.1.1 Pipe-laying units having an **OXY** notation in accordance with *Pt 3, Ch 17 Pipe-laying Units* are to be surveyed annually in accordance with the requirements of *Pt 1, Ch 3, 22 Scope of surveys*. A Special Survey in accordance with the requirements of *Pt 1, Ch 3, 22 Scope of surveys* is to be held at intervals not exceeding five years.

22.2 Scope of surveys

22.2.1 At each Annual Survey, leak testing of plant piping is to be performed using the ordinary operating pressures for oxygen and acetylene respectively. The gas supply to the plant piping is to be stopped by the central regulator being closed and the pressure in the plant piping is to then remain constant for at least eight hours. If pressure drop occurs in oxygen and/or acetylene plant piping, the plant is to be checked and repaired. The tests are to be carried out to the satisfaction of the Surveyor.

22.2.2 At each Special Survey, all plant piping is to be blown-through and be leak tested in accordance with the following:

(a) Dry and oil-free nitrogen is to be used for leak testing of low-pressure acetylene and oxygen piping and the test pressure is to be 12 bar. After eight hours, the pressure drop is not to exceed 0,4 bar.
(b) Acetylene piping on the high-pressure side is to be leak tested with dry and oil-free nitrogen at 25 bar. 25 bar relates to the maximum cylinder filling pressure at 15 °C. Where it is proposed to use cylinders with a higher filling pressure, the test pressure is to be agreed with LR.
(c) Oxygen piping on the high-pressure side is to be leak tested with 200-bar oxygen or dry and oil-free nitrogen. 200 bar relates to the maximum cylinder filling pressure at 15 °C. Where it is proposed to use cylinders with a higher filling pressure, the test pressure is to be agreed with LR.
(d) All valves, joints and other connections are to be checked for leakage by appropriate means.

The tests are to be carried out to the satisfaction of the Surveyor and be carried out by an appropriately qualified person.

Note: Prior to the leak tests, blow-through of acetylene and oxygen piping is to be carried out with dry and oil-free nitrogen. Nitrogen is to be blown in from the high-pressure side and be carried off at the outlet station. The outlet station(s) (torch, stop valves, regulators, manometers, flash back arrestors and non-return devices) is to be removed during the blow-through process. At blow-through, the pressure is to be gradually increased to approximately 12 bar and the blow-through process is to continue till dirt no longer escapes from the pipe. High-pressure pipes are to be blown-through separately. The risk of injury to personnel or damage to the plant from blown-through gas and dirt is to be considered.

Existing Section 22 has been renumbered 23.

■ *Section ~~22~~ 23*
Notations and Descriptive Notes

~~22.2~~ 23.2 Descriptive Notes

(Part only shown)

Descriptive qualification notes may be agreed indicating the type of unit in greater detail than is contained in the class notation, and/or providing additional information about the design and construction.

Descriptive Notes:		
Description	**Information**	**Further information**
~~**SBT (LR)**~~	~~Segregated ballast tanks certified by LR.~~	~~ShipRight Procedures~~

Part 3, Chapter 1
General Requirements for Offshore Units

■ *Section 2*
Information required

2.1 General

(Part only shown)
2.1.3 Where an **OIWS** class notation, for In-water Survey, is to be assigned, *see Pt 1, Ch 2 Classification Regulations*, plans and information covering the following items are to be submitted as applicable:

- Details showing how rudder pintle and bush clearances are to be measured and how the security of the pintles in their sockets is to be verified with the unit afloat.
- Details and arrangements for inspecting thrusters and sea chests.
- ~~Details showing how stern bush clearances are to be inspected and measured with the unit afloat.~~
- Details showing how for water-lubricated bearings, sternbush clearances are to be measured with the unit afloat.
- Details of arrangements for servicing and unshipping thrusters.
- Details and arrangements for servicing sea inlet valves and checking sea chests.
- Details of underwater marking, *see Pt 3, Ch 1, 6 Underwater marking*.
- Details of coating systems and cathodic protection, *see Pt 8 Corrosion Control.*

■ *Section 6*
Underwater marking

6.2 Design features

6.2.5 **Sea valves**. For the ~~Dry-docking Survey (Underwater Inspection)~~ Bottom Surveys associated with the Special Survey, means must be provided to examine any sea valve.

■ *Section 8*
Risks to personnel from dropped objects

8.1 Goal

8.1.1 The requirements of this Section are to ensure that preventive measures to protect personnel from hazards from dropped objects (DROPS), are addressed, in so far as they affect the objectives of classification.

8.2 Class notation

8.2.1 Where the requirements of this Section are met to the satisfaction of LR, units will be eligible to be assigned the **DROPS** class notation. This notation will be retained as long as the preventive measures to protect personnel from hazards from dropped objects are found to be maintained to the satisfaction of LR, upon examination at the prescribed surveys.

8.3 Scope

8.3.1 Each unit is required to have a DROPS management system in place that is relevant to the design and specifics of the unit.

8.3.2 The Builder or Owner is to create a general arrangement drawing of critical DROPS areas. This is to be clearly displayed in general information areas throughout the unit and accommodation.

8.3.3 The DROPS General Arrangement drawing will identify each area with colour coding and will clearly indicate the criticality levels within areas of the unit. The colour criticality coding is to be assigned as follows:
(a) Green Zone:
Area where there is a low risk of being injured by dropped objects.
(b) Yellow Zone:
Area where there is a risk of being injured by dropped objects.
(c) Red Zone:
Area where there is a significant risk of being injured by dropped objects.

8.3.4 Zones are to be clearly displayed at all access points to the respective areas. All signs are to be pictorial to eliminate potential issues with different languages. Refer to ~~BS EN IEC 62079:2001 Section 4.7.3.2~~ Part 12, Chapter 1, Section 35 *Signage* for further information.

8.3.5 All third-party equipment, permanent or temporary, is to undergo a design risk assessment before installation. Records and methods of inspecting the third-party equipment are to be maintained and available for LR review.

8.3.6 Suitable equipment and hand tools for working at height are to be provided. Details and records of inspection of such tools and equipment are to be maintained and available for LR review.

8.3.7 When the use of DROPS shelters is incorporated into the safety management system, full structural and installation details of the shelters, including the intended level of safety, are to be presented for LR review.

8.3.8 The preventive maintenance systems of the unit are to indicate where specialised work at height tooling is required for routine maintenance.

8.3.9 Details of electrical and mechanical controls to prevent objects falling, e.g. pipe clamps, are to be provided.

8.3.10 Details of visual indication and audible signals pertinent to the warning system for dropped objects are to be provided.

8.3.11 The risk of persons falling from height is to be considered. Details of safety nets and other fall arrest and drop protection arrangements are to be provided.

8.3.12 All handling activities, e.g. pipe handling and lifting objects, are to be considered as working under suspended loads and are to be considered in the DROPS management system.

8.3.13 An inventory of permanent fixed equipment is to be created and maintained by the unit; the inventory is to include photographs and a description of each item. The photographs are to be taken both from a distance and from close up to avoid confusion with identification. Each individual item of equipment is to be identified by permanent marking or by the use of suitably attached durable labels. This is to incorporate scheduled routine inspections to verify that no modifications, changes or damage to the equipment has occurred since the initial inspection on installation, or previous scheduled inspection.

8.3.14 An inventory of temporarily installed equipment is to be created and maintained by the unit. This will incorporate scheduled routine inspections to verify that no modifications, changes or damage to the equipment has occurred since the initial inspection on installation, or previous scheduled inspection.

8.3.15 A programme of scheduled surveys and inspection is to be created; methods and records of inspection and any remedial actions to prevent reoccurrence are to be maintained and be available for LR review.

8.3.16 A record of dropped objects, with reasons for each incident, is to be maintained, and is to be available for review by LR.

Part 3, Chapter 2
Drilling Units

■ *Section 1*
General

1.2 Class notations

1.2.6 Drilling units are to have preventive measures to protect personnel from the hazards of dropped objects in accordance with *Pt 3, Ch 1, 8 Risks to personnel from dropped objects* and are eligible for the special features class notation **DROPS**.

Part 3, Chapter 4
Accommodation and Support Units

■ *Section 1*
General

1.1 Application

1.1.3 Requirements for support units for the following functions are given in separate Chapters as follows:
(a) Fire-fighting Units *see Pt 3, Ch 5 Fire-fighting Units*.
(b) Pipe-laying Units *see Pt 3, Ch 17 Pipe-laying Units*.
(c) Crane Units *see Pt 3, Ch 18 Crane Units*.

1.2 Class notations

1.2.3 In general, units complying with the requirements of this Chapter and the relevant Parts of the Rules will be eligible for the assignment of one of the following class type notations, as appropriate:

- Accommodation unit.
- ~~Crane unit.~~
- Diving support unit.
- Support unit.
- Multi-purpose support unit.

~~1.2.7 When the type notation Crane unit is assigned to a unit, the main deck lifting appliances on the unit are considered to form an essential feature and therefore are to be included in the class.~~

Existing paragraphs 1.2.8 and 1.2.9 have been renumbered 1.2.7 and 1.2.8.

Part 3, Chapter 7
Drilling Plant Facility

Existing Section 10 Risks to personnel from dropped objects has been deleted in its entirety.

Existing Section 11 Trials has been renumbered 10.

Part 3, Chapter 10
Positional Mooring Systems

■ *Section 1*
General

1.4 Plans and data submission

(Part only shown)

1.4.1 The positional mooring system will be subject to review and approval. The following information and plans are to be submitted in an agreed electronic format, to cover the design review and class approval of the positional mooring system:

(a) Plans of the positional mooring system and associated equipment are to be submitted including the following, as applicable:

- General arrangement of offshore floating unit (including hull and topsides general arrangements).
- Layout and arrangement of deck mooring equipment and support structures.
- Structural arrangement of mooring equipment, support structure and attachment point to the main structure or hull of the ~~Offshore Unit~~ offshore unit.
- Mooring layout.
- Field layout.
- Anchor lines and fittings assembly.
- Anchor points.
- Fairleads/bending shoes, including associated mechanism, articulation or stopper.
- Cable (i.e. mooring line, steel wire or fibre rope or chain) stoppers or connectors.
- Winches, windlasses or tensioners.
- Deck equipment used in support of the mooring line failure response plan.
- General arrangement showing moorings for tandem and side-by-side offloading. This is to include the maximum and minimum dimensions and main particulars for the range of shuttle tankers that are permitted to attend. For each mooring line, the breaking load and the maximum and minimum angles (horizontal and vertical) between the line and the offshore unit are to be stated.
- Location of control stations.

■ *Section 3*
Environmental conditions

3.1 General

3.1.1 The Owner/Operator or designer is to specify the environmental criteria for which the unit is to be considered. The extreme environmental conditions applicable to the location, or operating areas, are to be specified, together with all operating environmental limits. Detailed specialist environmental reports are to be submitted, with sufficient supporting information to demonstrate the validity of the limiting criteria, *see Pt 3, Ch 10, 3.3 Metocean data*.

NOTE: For information on typical industry requirements on specialist environmental reports, 'ISO 19901-1, Specific Requirements for Offshore Structures - Part 1 Metocean design and operating considerations' may be consulted. For the purposes of these Rules, the definitions of environmental terms, e.g. squall and cyclone, given in ISO 19901-1 apply. The Class requirements remain those found in the Rules for Offshore Units, especially this ~~s~~Section.

■ *Section 6*
Anchor lines

6.1 General

6.1.2 An anchor line integrity monitoring system or device is to be provided for floating unit mooring systems, to detect line breakage and significant tension and offset irregularities under ambient environmental conditions as well as more severe storms within the envelope of design environmental conditions. This is generally not a requirement for offloading buoy systems. The following are to be taken into account:

- The precision and accuracy of the monitoring of the tension irregularities are to be documented for a load range up to at least 90 per cent of the breaking strength of the mooring lines. The precision and accuracy of the monitoring of the offset irregularities are to be documented for 100 per cent of the offset range.
- The availability and reliability of the system or device is to be taken into account in the mooring line failure response plan. A system is not required to be fully autonomous or to detect tension in each anchor line. A system can comprise monitoring offset irregularities combined with manual inspection to identify which line has broken. Accurate inclinometers on the mooring lines or unit position monitoring systems can be considered as a suitable alternative to a mooring line tension monitoring system.
- The mooring line integrity monitoring system shall be able to detect failure of any part along the line (between attachment point to Offshore Unit to at least the seabed touch down or embedment point. Ability to detect line failure beyond seabed touch down or embedment should be assessed and documented. The results should be taken into consideration when setting the scope of Offshore In Water Survey.

~~The precision and accuracy of the system is to be documented for a load range up to at least 90 per cent of the breaking strength of the mooring lines and 100 per cent of the offset range.~~

- Detection of tension anomalies or line breakage is to raise an alarm (at least visual). The system should be able to be interrogated on demand and present sufficient redundancy so that the system remains operational after failure of any one component and to enable inspection or testing, maintenance and repair without loss of operability.

Calibration checks are to be carried out at least once a year. Calibration and maintenance procedures and schedule are to be documented in the Operation Manual of the unit.

Part 3, Chapter 12
Riser Systems

■ *Section 4*
Environmental considerations

4.1 General

4.1.2 The extreme environmental criteria to be taken into account in the riser system design are, in general, to be based on a return period of:
(a) 50 years for Mobile Offshore Units.
(b) 100 years for Floating Offshore Installations at a Fixed Location.

For sites susceptible to cyclones, the design of riser systems for Floating Offshore Installations at a Fixed Location which remain on-station during cyclones is to be based upon the most onerous of the cyclonic and non-cyclonic environments determined at a return period of 100 years. For locations subject to squalls events, 100-year return period squalls are to be considered, *see also Pt 3, Ch 10, 3.4 Environmental parameters, 3.4.2*
See also Pt 4, Ch 3, 4 Structural design loads.

Part 3, Chapter 16
Wind Turbine Installation and Maintenance Vessels and Liftboats

■ *Section 1*
General

1.1 Application

1.1.1 The requirements of this Chapter apply to units or vessels engaged in installation and/or maintenance activities relating to offshore wind turbines and cover the unit types indicated in ~~1.2~~ *Pt 3, Ch 16, 1.2 General definitions*.

1.1.2 The requirements of this Chapter also apply to liftboats whose primary function is to provide support services to offshore wind turbine installations or other types of offshore installation, *see* ~~1.2~~ *Pt 3, Ch 16, 1.2 General definitions*.

1.1.3 The requirements in this Chapter are supplementary to those given in the relevant Parts of the Rules. Wind turbine installation vessels are additionally to comply with the applicable requirements of *Pt 3, Ch 18 Crane Units*.

1.1.4 Surface type units and surface type self-elevating units are to comply with LR's *Rules and Regulations for the Classification of Ships* ~~(hereinafter referred to as the Rules for Ships)~~, but aspects which relate to the specialised offshore function of the unit will also be considered on the basis of these Rules.

Part 3, Chapter 17
Pipe-laying Units

■ *Section 1*
General

1.2 Class notations

1.2.4 Pipe-laying units are to ~~which~~ have preventive measures to protect personnel from the hazards of dropped objects in accordance with *Pt 3, Ch 1, 8* ~~*Ch 7, 10*~~ *Risks to personnel from dropped objects* ~~will be~~ and are eligible for the special features class notation **DROPS**.

1.2.6 LR classed oxy-acetylene welding and cutting plants that have been constructed, installed and tested under LR's Special Survey in accordance with *Pt 3, Ch 17, 6 Oxy-acetylene Plants for Welding and Cutting* and *Pt 1, Ch 3, 22 Notations and Descriptive Notes* will be eligible for the special features class notation **OXY**. When an **OXY** notation is not assigned to a unit fitted with an oxy-acetylene welding and cutting plant, classification of the unit will be subject to the plant being certified by LR.

1.3 Scope

1.3.1 The following additional topics applicable to the class type notation are covered by this Chapter:
- Structural arrangements of the unit related to pipe-laying operations.
- Supporting structures for pipe-laying equipment, associated structures and offshore containers.
- Areas for pipe-laying operations and pipe-storage.
- Structural arrangements in way of moon pools.
- Integral tanks for the bulk storage of liquid chemicals.
- Hazardous areas and ventilation.
- Pollution prevention.
- Oxy-acetylene plants for welding and cutting.

■ *Section 3*
Hazardous areas and ventilation

3.1 Hazardous areas and ventilation

3.1.3 Areas where plant piping is purged/blown-through are to be adequately ventilated, *see also Pt 3, Ch 17, 6 Installation, testing and survey 6.9.1* and *Pt 1, Ch 3, 22 Descriptive notes 22.2.2*.

■ *Section 5*

Pipe-laying ~~System~~ system

5.2 Documentation, plans and data submission

5.2.4 Details of personnel protection equipment related to pipe-laying operations, its location and the National or International Standard(s) with ~~to~~ which it is in compliance ~~compliant with, e.g. tinted goggles for eye protection to BS EN 169, are to be provided~~ are to be included in the Safety Management System.

5.2.7 Particulars of piping arrangements and control systems for gas distribution systems for welding, cutting and purging are to be submitted, including material specifications, design pressures, design temperatures and control system operational specification.

5.2.8 General arrangement plans, design calculations and process flow diagrams of acetylene and oxygen gas generation plants, including calcium carbide storage and transfer systems (e.g. hoppers) are to be submitted, if fitted.

Existing sub-Section 5.3 has been renumbered 6.2.

Existing Section 6 has been renumbered Section 8.

■ *Section 6*

Oxy-acetylene plants for welding and cutting

6.1 General

6.1.1 LR classed oxy-acetylene welding and cutting plants that have been constructed, installed and tested under LR's Special Survey in accordance with this Section and *Pt 1, Ch 3, 22 Notations and Descriptive Notes* will be eligible for the special features class notation **OXY**. All parts of oxy-acetylene welding and cutting plants are to comply with this Section.

6.1.2 Burners, stop valves, regulators, non-return devices, high-pressure pipes and other accessories in connection with the welding and cutting equipment are to be in accordance with a recognised National or International Standard, *see Pt 12, Ch 1, 8.1 Recognised codes and standards for compressed gas utility systems*.

6.1.3 Operating instructions for the oxy-acetylene welding and cutting plant are to be supplied by the equipment vendor(s) and kept on board.

6.1.4 Operating instructions are to include the instruction that when the oxy-acetylene welding and cutting plant is not in use, all valves in the plant are to be kept closed.

~~5.3~~ 6.2 Compressed gas consumables ~~for welding and cutting~~

~~5.3.1~~ 6.2.1 Portable gas cylinders and other pressure vessels used to transport and store liquids or gases under pressure, e.g. acetylene and oxygen, are to comply with an acceptable National or International Standard, *see also Pt 12, Ch 1, 8 Compressed gas utility systems*.

~~5.3.5~~ 6.2.2 Further guidance, which should be consulted, is given in Chapter 9.17 of the MODU Code - Code for the Construction and Equipment of Mobile Offshore Drilling Units, and also the following documents from the British Compressed Gas Association (BCGA):

- BCGA *Guidance Note GN2 Guidance for the storage of gas cylinders in the workplace*
- BCGA *Code of practice CP7 The safe use of oxy-fuel gas equipment (individual portable or mobile cylinder supply)*
- BCGA *Guidance Note GN11 Reduced oxygen atmospheres*.

~~5.3.2~~ 6.2.3 Means are to be provided to secure portable gas cylinders at all times.

~~5.3.3~~ 6.2.4 Portable gas cylinders are to be stored in accordance with Chapter 9.17 of the MODU Code - Code for the Construction and Equipment of Mobile Offshore Drilling Units. Portable gas cylinders are to be stored in a well-ventilated area. The storage area should be protected from wave impacts and located away from sources of heat, sparks and fire risk. Cylinders should be stored upright and well secured.

~~5.3.4~~ 6.2.5 Oxygen cylinders are to be stored in an area free from combustible material. When stored in open locations, oxygen and fuel gas (e.g. acetylene/propane) cylinders are to be stored in separate open locations in accordance with a recognised Standard *see Pt 12, Ch 1, 8 Compressed gas utility systems*. Where two or more cylinders of oxygen or fuel gas are intended to be carried in enclosed spaces, separate dedicated storage rooms should be provided for oxygen cylinders and for fuel gas cylinders, with the storage rooms constructed of steel. Provision should be made for the expeditious removal of cylinders in the event of fire. Alternative proposals to cool the cylinders in-situ with a drencher system in the event of a fire will be specially considered.

6.2.6 Gas cylinders are not permitted to be stored in the engine-room.

6.2.7 Any protective arrangements for the transport, handling and storage of portable gas cylinders resulting from the fire and explosion evaluation report (*see Pt 3 Ch 17, 8.1 General 8.1.2*) and dropped object risk assessment (*see Pt 3, Ch 1, 8 Risks to personnel from dropped objects*) are to be incorporated in the design documentation.

6.3 High-pressure piping systems between gas cylinders and regulators

6.3.1 Acetylene pipes are to comply with the following:

(a) Pipes are to be of stainless steel. All pipes are to be seamless. Piping and accessories are to be certified for use up to 300 bar.

(b) Copper or copper alloys containing more than 65 per cent of copper are not to be used in connection with acetylene. In plants where two or more cylinders of acetylene are connected to a manifold, the supply pipes between the cylinders and the manifold are to be fitted with non-return valves that comply with an acceptable National or International Standard, *see Pt 12, Ch 1, 8 Compressed gas utility systems*.

6.3.2 Oxygen pipes are to comply with the following:

(a) Pipes are to be of copper. All pipes are to be seamless. Piping and accessories are to be certified for use up to 300 bar. In plants where two or more cylinders of oxygen are connected to a manifold, the supply pipes between the cylinders and the manifold are to be fitted with non-return valves that comply with an acceptable National or International Standard, *see Pt 12, Ch 1, 8 Compressed gas utility systems*.

Note. 300 bar is related to a maximum gas cylinder filling pressure of 200 bar at 15 °C. Where it is proposed to use cylinders with a higher filling pressure, the pressure to which piping and accessories are to be certified is to be agreed with LR.

6.3.3 Safety valves fitted at gas supplies are to discharge to a vent point on the open deck. The vent point is to be in a safe place at a height of minimum 3 m above deck.

6.4 Low-pressure piping systems downstream of regulators

6.4.1 Pipes are to be seamless, made of ST 35 material with a wall thickness of minimum 2,0 mm or equivalent and/or in conformity with the requirements of a recognised Classification Society. Pipes on the open deck are to have a thickness of at least 2,5 mm.

6.4.2 Pipes are to be laid freely and be so arranged that they are protected against damage. They are not to penetrate unventilated rooms, lockers, etc. or be laid in crew or passenger accommodation.

6.4.3 Expansion loops are to be placed where necessary and piping that penetrates a deck or bulkhead is to be sheathed in protection tubes of hard plastics or fibre material. All pipes are to be securely fastened so as to be protected against damage. The distance between fastening clamps is not to exceed 2,5 m.

6.4.4 Pipes are to be laid with as few joints as possible. In new installations, joints are to be welded with a tungsten inert gas welding or acetylene/oxygen unit. In existing installations, joints are to be expertly welded end to end. Joints are to be fitted in places readily accessible for inspection.

6.4.5 Disconnectable couplings are not accepted as a substitute for welded joints.

6.5 Outlet stations

6.5.1 Outlet stations are to have stop valves, regulators, manometers, safety devices against backfire and gas backflow (flash back arrestors) and non-return devices and are to be located in a cabinet or otherwise satisfactorily protected.

6.6 Signs/notices and marking

6.6.1 Signs required by this sub-section are to be designed in accordance with a recognised Code or Standard, see Pt 12, Ch 1, Section 35 Safety signage.

6.6.2 Entrance doors to enclosures or rooms where acetylene and oxygen cylinders are stored are to be fitted with warning notices which in writing and illustrations clearly express:

DANGER GAS UNDER PRESSURE
Fire, open flame and smoking prohibited. Remove cylinders to a safe place in case of fire.

6.6.3 In the immediate vicinity of gas regulator and cylinders etc, a sign is to be posted with directions for use and clearly worded text giving the necessary detailed instructions for their use.

6.6.4 In the immediate vicinity of the regulators, notices are to be posted clearly stating the maximum pressures in the plant piping permitted between the regulators and the outlet stations.

6.6.5 Vents from safety valves and similar devices are to be marked with the following text:

DANGER GAS
Fire, open flame and smoking prohibited.

6.6.6 At the outlet stations, notices indicating the operating pressure are to be posted. Signs are also to be posted clearly stating that the valves are to be closed when the installation is not in use.

6.6.7 Pipes are to be colour-coded and labelled in such a way there will be no doubt as to which gases are conveyed by the pipes. Colour schemes and labels are to be in accordance with the relevant Statutory Regulations and/or requirements of the National Administration in the country of registration or the area of operation as applicable, otherwise in accordance with recognised Standards e.g. ANSI/ASME A13.1, BS 1710 or ISO 14726. As colour schemes may differ, the title of the regulations or standards adopted are to be clearly stated by the inlets and outlet stations.

6.6.8 Gas cylinder storage areas are to be clearly marked with signs showing that oxygen and acetylene cylinders are stored there.

6.6.9 Gas cylinders are to be colour-coded and labelled in accordance with the relevant Statutory Regulations of the National Administration in the country of registration and the areas of operation as applicable, otherwise in accordance with recognised Standards e.g. BS EN 1089-3 and BS EN 7225. As colour schemes may differ, the title of the regulations or standards adopted are to be clearly stated on the cylinders.

6.7 The carriage/transportation of gas cylinders

6.7.1 A means of conveyance is to be provided for the carriage of acetylene and oxygen cylinders on board the unit, and during the transportation of such cylinders to and from the unit.

6.8 Acetylene and oxygen gas generation plants

6.8.1 Gas generation plants are to meet the applicable requirements of *Pt 3, Ch 8 Process Plant Facility* and are to be capable of being demonstrated to be suitable for use in the marine environment by type approval or other means.

6.8.2 The supply pipes between the generation plants and the manifold are to be fitted with non-return valves that comply with relevant standards.

6.8.3 Containerised plants are additionally to comply with *Pt 3, Ch 4, 2.4 Offshore containers*.

6.9 Installation, testing and survey

6.9.1 Prior to the installation of acetylene and oxygen piping, pipes and connections are to be thoroughly cleaned to remove all grease, oil and other combustible substances. No combustible or organic solvent is to be used for this purpose. Pipes and connections are to be blown clean with dry and oil-free nitrogen, after degreasing and prior to and after installation. Compressed air from an oil-lubricated compressor or oxygen are not be used.

6.9.2 After completed installation or repairs of the oxy-acetylene plant and otherwise at five-yearly intervals, all plant piping is to be blown through and be leak tested in accordance with *Pt 1, Ch 3, 22 Notations and Descriptive Notes*. The risk of injury to personnel or damage to the plant from blown-through gas and dirt is to be considered.

■ *Section 7*
Electrical welding plants

7.1 General

7.1.1 Arc welding power sources and plasma cutting systems are to comply with BS EN/IEC 60974-1 *Arc welding equipment - Part 1: Welding power sources*.

7.1.2 Arc welding torches are to comply with BS EN/IEC 60974-7 *Arc welding equipment - Part 7: Torches*.

7.1.3 The installation of arc welding equipment is to comply with IEC 60974-9 *Arc welding equipment - Part 9: Installation and use. See also Part 12, Chapter 1, Section 16 Electrical welding systems*.

Existing Section 6 has been renumbered Section 8.

■ *Section ~~6~~ 8*
Safety systems, hazardous area and fire

~~6.1~~ 8.1 General

~~6.1.2~~ 8.1.2 The gas generation, storage and distribution systems and the transport, handling and storage arrangements of portable gas cylinders for welding and cutting are to be included in the unit's 'Fire and Explosion Evaluation' (FEE) report, *see Pt 7, Ch 3, 2.4 Fire and Explosion Evaluation (FEE)*. For welding and cutting stations, reference is to be made to NFPA 51 *Standard for the Design and Installation of Oxygen - Fuel Gas Systems for Welding, Cutting, and Allied Processes*. For acetylene and oxygen gas generation plants, reference is to be made to NFPA 55 *Compressed Gases and Cryogenic Fluids Code*.

Part 3, Chapter 18
Crane Units

■ *Section 1*
General

1.1 Application

1.1.1 The requirements of this Chapter apply to mobile offshore units fitted with cranes intended for heavy-lift operations and are additional to those applicable in other Parts of the Rules. Crane unit operations include the loading and offloading at quayside, the transportation at sea and the installation and removal offshore of jackets, connecting bridges, topsides, foundations, moorings, transformer substations and other structures. This Chapter is also applicable to crane units equipped to install wind turbines offshore with modified cranes or dedicated handling equipment. Heavy lift cranes are defined in *Ch 4, 1.2 Lifting appliances and crane types 1.2.1(i)* of the *Code for Lifting Appliances in a Marine Environment, July 2017, incorporating Notice No. 1 & 2*,.

1.1.2 The following types of crane units are to be classed as mobile offshore units and are to comply with the relevant parts of these Rules:
(a) Column-stabilised semi-submersible.
(b) Twin-hull surface-type.
(c) Self-elevating.

1.1.3 Crane barges and ships may be optionally classed as mobile offshore units, in which case they are to comply with the relevant Parts of these Rules. Alternatively, crane barges and ships may be classed entirely with the *Rules and Regulations for the Classification of Ships, July 2017 incorporating Notice No. 1, 2, 3 & 4*, in which case they are not eligible for the **OU** and **OIWS** class notations. The *Rules and Regulations for the Classification of Offshore Units, July 2017, incorporating Notice No. 1 & 2* provide a higher basis of design for the hull (50-year return period loads and 25-year minimum fatigue life, *see Pt 4, Ch 3, 4.1 General 4.1.4(a)* and *Pt 4, Ch 5, 5.2 Fatigue life assessment 5.2.3*) compared to the *Rules and Regulations for the Classification of Ships, July 2017 incorporating Notice No. 1,2,3 & 4* (20-year return period loads and no required fatigue assessment).

1.1.4 All lifting appliances which form an essential feature of the vessel, are to be classed in accordance with LR's *Code for Lifting Appliances in a Marine Environment, July 2017, incorporating Notice No. 1 & 2*. Non-essential lifting appliances may be optionally classed (*see Ch 1, 1.3, Table 1.1.1 Special features class notations associated with lifting* appliances of the *Code for Lifting Appliances in a Marine Environment, July 2017, incorporating Notice No. 1 & 2*). The forces on the lifting appliances due to inclinations and motions of the unit are to be determined by calculation considering all lifting and non-lifting modes of operation. The lifting appliances are to be designed to the most critical loadings and motions.

1.1.5 Pedestal structure which is not part of the hull and not part of the main support structure of the pedestal is to be classed in accordance with *Ch 4, 5 Pedestals and foundation of the Code for Lifting Appliances in a Marine Environment, July 2017, incorporating Notice No. 1 & 2*.

1.1.6 Classification of the crane unit will cease to be valid if a significant alteration is made to the classed lifting appliances which form an essential feature or the arrangements on board without the written approval of LR.

1.1.7 Crane units which have a diving complex on board are to have the diving installation approved in accordance with LR's *Rules and Regulations for the Construction and Classification of Submersibles and Diving Systems, July 2017, incorporating Notice No.1 & 2* or a recognised standard acceptable to LR.

1.1.8 Requirements additional to those of this Chapter may be imposed by the National Authority/Coastal State Authority in the country in which the crane unit is registered and/or is to operate, e.g. crane units may require compliance with *The International Code of Safety for Special Purpose Ships (SPS Code)* supplemented by the stability requirements of the *MODU Code*.

1.2 Class notations

1.2.1 Mobile offshore units complying with the requirements of this Chapter and the relevant Parts of these Rules will be eligible for the assignment of the **Crane unit** class type notation and the special feature class notation **LA**.

1.2.2 Crane units equipped to install wind turbines offshore which comply with the requirements of this Chapter will be eligible for the assignment of the class type notation **MainWIND**.

1.2.3 Other special features class notations associated with lifting appliances may be assigned, *see Pt 3, Ch 11 Lifting Appliances and Support Arrangements*.

1.2.4 Crane units may be assigned additional class type notations when appropriate, *see Pt 3, Ch 4, 1.2 Class notations 1.2*.

1.2.5 Crane units are to have preventive measures to protect personnel from the hazards of dropped objects in accordance with *Pt 3, Ch 1, 8 Risks to personnel from dropped objects* and are eligible for the class notation **DROPS**.

1.2.6 Dynamic positioning systems for crane units are to comply with the requirements of *Pt 3, Ch 9 Dynamic Positioning Systems* and will be eligible for the **DP(AA)** or **DP(AAA)** class notation.

1.2.7 Crane units with an oxy-acetylene welding and cutting plant that has been constructed, installed and tested under LR's Special Survey in accordance with Pt 3, Ch 17, 6 Oxy-acetylene Plants for Welding and Cutting and Pt 1, Ch 3, 22 Oxy-acetylene Welding and Cutting Plants will be eligible for the assignment of the class notation **OXY**. An oxy-acetylene welding and cutting plant that has not been constructed, installed and tested under LR's Special Survey is to be certified by LR.

1.3 Cargo securing

1.3.1 Crane units designed to carry cargo on board (on decks or in holds) are to comply with the IMO CSS Code - *Code of Safe Practice for Cargo Stowage and Securing* and should carry a Cargo Securing Manual as detailed in MSC.1/Circular.1353/Rev.1 - *Revised Guidelines for the Preparation of the Cargo Securing Manual*.

Note. The IMO CSS Code defines cargo as, 'Cargo unit means a vehicle, container, flat, pallet, portable tank, packaged unit, or any other entity, etc., and loading equipment, or any part thereof, which belongs to the ship but is not fixed to the ship as defined in Assembly resolution A.489(XII).'

For the purposes of the IMO CSS Code, the objects and equipment carried on decks or in holds by crane units are generally to be considered as cargo.

1.3.2 Fixed cargo securing fittings, their materials and testing are to comply with the following Sections from the Rules for Ships;

- *Pt 3, Ch 14, Cargo Securing Arrangements, 1 General.*
- *Pt 3, Ch 14, Cargo Securing Arrangements*, *2 Fixed cargo securing fittings, materials and testing*.
- *Pt 3, Ch 14, Cargo Securing Arrangements*, *10 Surveys*.

1.3.3 The hull structure in way of fixed cargo securing fittings is to comply with *Pt 3, Ch 14, 4, Ship structure*.

1.3.4 Project-specific cargo securing arrangements for crane units are to comply with 1.6.1.

1.4 Installation layout and safety

1.4.1 In principle, crane units are to be divided into main functional areas to ensure that the following areas are separated and protected from each other:

(a) Areas for crane unit operations, including areas for laydown, cargo securing and storage of equipment;
(b) Auxiliary equipment area;
(c) Living quarters' area.

1.4.2 Attention is to be given to the relevant Statutory Regulations for fire safety of the National Administration in the country of registration and the areas of operation as applicable, *see Pt 1, Ch 2, 1 Conditions of classification* and *Pt 7, Ch 3 Fire Safety*.

1.4.3 Areas for crane unit operations are to be located with sufficient access to allow safe cargo securing and handling during installation/connection of equipment, e.g. shackles, lift tools and spreader bars/frames.

1.4.4 Living quarters, lifeboats and other evacuation equipment are to be located in non-hazardous areas and be protected and separated from the areas for crane unit operations. Consideration is to be given to credible accidents resulting from crane unit operations including dropped objects, fire and explosion, spillage and hazardous materials as applicable. *See also Part 4, Chapter 3, 4.16 Accidental loads*

1.4.5 Areas where ignition sources may be present, e.g. hot work to weld sea fastenings, are to be located away from areas where flammable vapours may be present, e.g. in the vicinity of fuel tanks.

1.4.6 Additional requirements for safety systems and hazardous areas are given in *Pt 7, Safety Systems, Hazardous Areas and Fire*.

1.5 Plans and data submission

1.5.1 Plans, calculations and data are to be submitted as required by the relevant parts of the Rules and *Code for Lifting Appliances in a Marine Environment, July 2017, incorporating Notice No. 1 & 2* together with the additional plans and information listed in this Chapter.

1.5.2 Details of all intended lifting and non-lifting modes of operation are to be submitted and for each mode of operation to be approved, the operations manual is to include the information required by *Pt 3 Ch 1, 3 Operations manual*.

1.5.3 Details of pile hammers, pile drills, their power arrangements and any other equipment pertinent to the function of the crane unit are to be submitted.

1.6 Appraisal of project-specific operations for crane units in service

1.6.1 Project-specific operations for crane units in service, e.g. heavy lifts and cargo securing, should normally be the subject of an engineered assessment by the Owner and be reviewed by a marine warranty surveyor and need not be submitted to LR for approval.

However, where it is anticipated that the design limits specified in the operations manual may be exceeded or a significant alteration is proposed to be made e.g. to the fixed cargo securing fittings or the cargo securing arrangements, the project-specific assessment is to be submitted to LR for review and the proposed strengthening arrangements, alterations and/or mitigating measures for approval.

1.6.2 Where crane units are deployed in decommissioning, records of hazardous materials brought on board and their subsequent removal are to be kept and made available to the Surveyor.

1.7 Minimum design temperature

1.7.1 The minimum design temperature of the crane unit is to be taken in accordance with *Pt 3, Ch 1, 4.4 Minimum design temperature*. However, the minimum design temperature of the lifting appliances is to be taken in accordance with *Ch 4, 2.25 Materials 2.25.3* of the *Code for Lifting Appliances in a Marine Environment, July 2017, incorporating Notice No. 1 & 2*.

■ *Section 2*
Structure

2.1 Plans and data submission

2.1.1 In addition to the structural plans and information as required by *Pt 3, Ch 1, 2 Information required* and *Pt 4, Ch 1,4 Information required*, additional plans are to be submitted showing:

(a) Cranes, other lifting appliances, boom rests and their supporting structures.
(b) Details of castings e.g. cast nodes for column-stabilised crane units.
(c) Fixed cargo securing fittings and arrangements.
(d) Jacket restraint structures (for the securing of jackets for transportation) and their supporting structures.
(e) Foundations and supporting structure to any major mission equipment (e.g. hydraulic power units for pile hammers and grippers).

2.1.2 The general arrangement plan of the crane unit is to include the locations of the following:

(a) Cranes, other lifting appliances, frames and boom rests.
(b) Arrangement of cranes showing slewing angles, radiuses and inclinations of the crane booms.
(c) Work, laydown and storage areas including fixed cargo securing fittings and grillages.
(d) Hatches and other openings to enclosed spaces for lifting operations.
(e) Doors, hatches, ventilation and other openings to crew accommodation, control stations, stations for crane unit operations, store rooms and workshops.
(f) Jacket restraint structures.

2.2 Structural assessment

2.2.1 The global structure is to be designed for all lifting and non-lifting modes of operation for the design load combinations defined in *Pt 4, Ch 3, 4.3 Load combinations*. The most unfavourable loading conditions are to be assessed, which are to be determined by considering:

(a) Single crane lifts and combined crane lifts (where more than one heavy-lift crane is installed).
(b) Lifts with maximum loads resulting from crane operations taking into account all significant load combinations, crane configurations, and crane positions (e.g. luffing angles, slewing angles).
    Note. All combinations of maximum horizontal forces, vertical forces and overturning moments and slewing moments are to be considered. Reference is also made to the crane load versus radius diagrams/charts.
(c) Crane lifts in sheltered water, shallow water and deep water and the effect on the motions of the unit, as applicable.
(d) The stages/sequence of crane unit operations, set-down and transportation, which are to be defined.
(e) Limits of stability.
(f) The range of draughts and metacentric heights (GM).
    Note. Lifting at shallow draughts may result in higher global loads. A large GM may result in a higher pitch and roll accelerations with higher forces acting on the securing devices.
(g) Load cases with and without heavy payload on deck.
    Note. Load cases without heavy payload may have higher hydrostatic loads to maintain the same draught.
(h) The effect of wind heeling.
(i) Coupled dynamics of the unit, the barge from which the object is lifted and the object itself, as applicable.
(j) The type of objects to be lifted and whether the lifts take place in air, in water or through both.
(k) Survival and transit conditions including the transportation of payload on deck.
(l) Tank loading patterns.
(m) Float-on float-off loading conditions, as applicable.
(n) Roll-on roll-off loading conditions, as applicable.
(o) Skid-on skid-off loading conditions, as applicable.
(p) Any other foreseeable operational or emergency scenarios and related loads and loading conditions (e.g. gross overload, emergency load release).

Where it is demonstrated that accidental loads only cause local damage, global strength need not be investigated for loading condition (c) in *Pt 4, Ch 4, 4.3 Load conditions*.

2.2.2 Jacket removal and transport load cases are to consider:

(a) All structural and non-structural jacket items.

(b) Rigging arrangements.
(c) The degrees of freedom at the jacket restraints.
(d) Spring stiffness for the jacket restraints, crane tips and boom.

2.2.3 The model test programme is to consider all lifting and non-lifting modes of operation, *see Pt 4, Ch 1, 4.6 Model test specifications and reporting*.

2.2.4 The design loadings for the strength of areas for working, laydown, storage and the structure supporting any major mission equipment, e.g. hydraulic power units, are to be defined by the designers/Builders. Calculations are to be submitted for the design loadings, including the effect of vessel deflections.

2.2.5 Dynamic lifting cases are to include hook load dynamic amplification (hoisting) factors which are to be applied to the lifted object and its rigging.

2.2.6 The limiting environmental criteria for each lifting case are to be specified by the Owner as operability curves (significant wave height versus peak period) with associated wind conditions and vessel heading relative to the directions of wind and waves. Any associated limiting criteria for each lifting case are also to be specified, e.g. crane boom positions and slew angle, heel and trim of the crane unit and the motions of the unit or barge to or from where the object is lifted.

2.2.7 Where the global structure is designed to lifting cases with lifting loads less than the safe working loads of the crane, restrictions are to be recorded in the Operations Manual and on the load versus radius diagrams/charts.

2.2.8 The return periods of the environmental parameters for non-lifting load cases (for design load combinations (b) and (d) defined in *Pt 4, Ch 3, 4.3 Load combinations*) are specified in *Table 18.2.1 Return periods of the environmental parameters for non-lifting dynamic load cases* for the respective loading condition.

Table 18.2.1 Return periods of the environmental parameters for non-lifting dynamic load cases

Loading condition (mode of operation)	Return period for load cases (b) and (d)
Operating – Non-lifting	1 year, *see* Note 1
Inspection/maintenance	1 year
Survival	50 years
Transit	25 years
Note 1. Where requested by the Owner/designer, a return period longer than 1 year may be used.	

2.2.9 For work, laydown and storage areas subject to heavy wear, e.g. dragging lifting gear, a thickness allowance to account for wear in addition to the corrosion allowance required by *Pt 4, Ch 3, 7 Corrosion editions* is recommended.

2.3 Materials

2.3.1 Crane pedestals, boom rests and their support structures are to be divided into the following categories defined in *Pt 4, Ch 2, 2.1 General 2.1.2*:

- Special structure.
- Primary structure.
- Secondary structure.

2.4 Offshore containers

2.4.1 Offshore containers are to comply with *Pt 3, Ch 4, 2.4 Offshore containers*.

■ *Section 3*
Main and auxiliary machinery

3.1 General

3.1.1 Requirements for the design and construction of main and auxiliary machinery are given in *Pt 5 Main and Auxiliary Machinery*, which are to be complied with.

3.2 Rapid ballast systems

3.2.1 Requirements for rapid ballast systems are given in *Pt 5, Ch 13, 5.7 Ballast pipe supports and foundations of ballast pumps*.

Existing Chapters 18 to 20 have been renumbered 19 to 21.

Part 4, Chapter 1
General

■ *Section 4*
Information required

4.2 Plans and supporting information

(Part only shown)
4.2.2 The following supporting plans and documents are to be submitted:

- General arrangement showing moorings for tandem and side by side offloading. This is to include the maximum and minimum dimensions and main particulars for the range of shuttle tankers that are permitted to attend. For each mooring line, the breaking load and the maximum and minimum angles (horizontal and vertical) between the line and the offshore unit are to be stated.
- General arrangement showing barge mooring arrangements where barges are to be moored alongside the unit.

Part 4, Chapter 2
Materials

■ *Section 2*
Structural categories

2.2 Column-stabilised and tension-leg units

(Part only shown)
2.2.1 In general, the structural members of column-stabilised and tension-leg units are to be grouped into the following structural categories:

(b) **Primary structure:**
  (v) Heavy substructures and equipment supports, e.g. drillfloor substructure, crane pedestals and boom rests, anchor line fairleads and their supporting structure, *see also Pt 4, Ch 2, 2.1 General 2.1.3.*
  (viii) Jacket restraint structures for crane units.

2.4 Ship units and other surface type units

(Part only shown)
2.4.3 In general, the structure of ship units and other surfaces type units is to be grouped into the following structural categories:

(b) **Primary structure:**
  (viii) Heavy substructures and equipment supports, e.g. integrated support stools to process plant, drill floor substructure, crane pedestals and boom rests, anchor line fairleads and chain stoppers for positional mooring systems and their supporting structures, *see also Pt 4, Ch 2, 2.1 General 2.1.3*.
  (xv) Jacket restraint structures for crane units.

Part 4, Chapter 3
Structural Design

■ *Section 4*
Structural design loads

4.1 General

4.1.4 The design environmental criteria determining the loads on the unit and its individual elements are to be based upon appropriate statistical information and have a return period (period of recurrence) for the most severe anticipated environment of at least:

(a) 50 years for Mobile Offshore Units.
(b) 100 years for Floating Offshore Installations at a Fixed Location.

For sites susceptible to cyclones, the design of units which remain on-station during cyclones is to be based upon the most onerous of the cyclonic and non-cyclonic environments determined at the return periods in *Pt 4, Ch 3, 4.1 General 4.1.4 (a)* and *Pt 4, Ch 3, 4.1 General 4.1.4* (*b)* for the respective unit type.

If a unit is restricted to seasonal operations in order to avoid extremes of wind and wave, such seasonal limitations must also be specified.

4.6 Wind loads

Table 3.4.1 Structural parts to be considered for wind loading

Wind speed averaging time interval	Structural category
3 second gust	Individual members and equipment secured to them. Wind loads need not be combined with current and wave loads.
5 second mean (sustained)	Part or whole of a structure whose greatest horizontal or vertical dimension does not exceed 50 m. Wind loads need not be combined with current and wave loads.
15 second mean (sustained)	Part or whole of a structure whose greatest horizontal or vertical dimension exceeds 50 m. Wind loads need not be combined with current and wave loads.
1 minute mean (sustained) *see* Note	~~The~~ Part or whole structure of the unit regardless of dimension for use with the maximum wave and current loads.
NOTE In no case is the one minute mean value to be taken as less than 25,8 m/s (50 knots). However, for unrestricted service the following wind criteria are also to be applicable for structural design considerations: (a) for all modes of operation, whether afloat or supported by the sea bed, a sustained one minute mean wind velocity of not less than 36 m/s (70 knots) (b) for the survival condition, a sustained one minute mean wind velocity of not less than 51,5 m/s (100 knots) The factors of safety are to comply with *Table 5.2.1 Factors of safety for the combined load cases* load case (b).	

■ *Section 6*
Procedures for testing tanks and tight boundaries

6.4 Structural test procedures

6.4.1 Where a structural test is specified in *Table 3.6.1 Testing requirements*~~.~~, unless specified otherwise, a hydrostatic test is to be carried out in accordance with *Pt 4, Ch 3, 6.6 Definitions and details of tests 6.6.1*. Where practical limitations prevent a hydrostatic test being carried out, a hydropneumatic test in accordance with *Pt 4, Ch 3, 6.6 Definitions and details of tests 6.6.2* is to be conducted. All external boundaries of the tested space are to be examined for structural distortion, bulging, buckling or other related damage and leaks.

6.4.2 A hydrostatic test or hydropneumatic test may be carried out afloat to confirm the structural adequacy of tanks, provided that a leak test is carried out ~~beforehand~~ and the results are confirmed as satisfactory . Where possible, the leak test is to be carried out before the unit is afloat.

6.4.4 Where the structural adequacy of a tank has been verified by structural testing on a previous vessel in a series, tanks of structural similarity on subsequent vessels within that series (which are built at the same shipyard following the same construction, welding and quality procedure) may be exempt from such testing, provided that the watertightness of all exempt tanks is verified by leak tests and thorough inspection. ~~For sister ships built several years after the last ship in a series, such exemptions may be reconsidered.~~ However, structural testing is to be carried out for at least one tank of each type of tank on ~~each~~ every vessel in the series ~~in order to verify structural fabrication adequacy~~. The relaxation to accept leak testing and thorough inspections instead of a structural test on subsequent vessels in a series does not apply to cargo space boundaries adjacent to other compartments ~~and~~ or to the boundaries of tanks for segregated cargoes or pollutants.

6.4.7 Consideration is to be given to the selection of tanks to be structurally tested. Selected tanks ~~should be~~ are to be chosen so that all representative structural members are tested for the expected tension and compression.

6.5 Leak test procedures

6.5.1 Where a leak test is specified in *Table 3.6.1 Testing requirements*, unless specified otherwise, a tank air test, compressed air fillet weld test~~,~~ or vacuum box test is to be carried out in accordance with the applicable requirements of *Pt 4, Ch 3, 6.6 Definitions and details of tests 6.6.4* to *Pt 4, Ch 3, 6.6 Definitions and details of tests 6.6.6*. A hydrostatic or hydropneumatic test conducted in accordance with the applicable requirements of *Pt 4, Ch 3, 6.6 Definitions and details of tests 6.6.1* and *Pt 4, Ch 3, 6.6 Definitions and details of tests 6.6.2* will be accepted as a leak test on the condition that safe access to all joints being examined is provided. Where a hydrostatic or hydropneumatic test is applied as a leak test, the external boundaries are to be free of any liquid residue prior to the commencement of the test.

6.5.4 Where acceptable to the attending Surveyor, provided that careful visual inspections show a continuous uniform weld profile shape, free from repairs, and the results of selected NDE testing show no significant defects, the leak testing of automatic butt welds and semi-automatic (flux core arc welding) butt welds may be omitted.

6.6 Definitions and details of tests

6.6.3 **Hose test** is a test used to verify the tightness of joints with a jet of water. The jet of water is to be directed perpendicular to the joint. It is to be carried out with the pressure in the hose nozzle maintained at not less than 2,0 bar during the test. The hose nozzle is to have a minimum inside diameter of 12 mm and is to be situated no further than 1,5 m from the joint. Where a hose test is not practical because of possible damage to machinery, electrical equipment insulation or outfitting items, it may be replaced by a careful visual examination of welded connections, supported by an ultrasonic or penetration leak test, or an equivalent, see SOLAS Reg. II-1/*Regulation 11 – Initial testing of watertight bulkheads, etc*.~~.~~

6.6.4 **Tank air test** is to be used to verify the tightness of a compartment by means of an air pressure differential and leak ~~detection~~ indicator solution. An efficient indicating solution (e.g.~~,~~ soapy water) is to be applied to the weld or penetration being tested and is to be examined whilst an air pressure differential of not less than 0,15 bar is applied by pumping air into the compartment. ~~It is recommended that the air pressure in the tank be raised to and maintained at 0,20 bar above atmospheric pressure for one hour, with a minimum number of personnel in the vicinity of the tank, before being lowered to 0,15 bar above atmospheric pressure.~~ Arrangements are to be made to ensure that any increase in air pressure does not exceed 0,30 bar. A U-tube with a height sufficient to hold a head of water corresponding to the required test pressure is to be used for verification and to avoid overpressure. The cross-sectional area of the U-tube is not to be less than that of the pipe supplying air to the tank. ~~In addition, the test pressure is to be verified by means of a pressure gauge, or alternative equivalent system.~~ Alternatively two calibrated pressure gauges may be considered acceptable. All boundary welds~~, erection joints and penetrations~~ including pipe connections in the compartment are to be examined twice. The first is to be examined immediately upon applying the leak indication solution; the second approximately five minutes afterwards.

6.6.8 **Penetration test** may be used where a hose test is not practical to assess butt welds, *see Pt 4, Ch 3, 6.6 Definitions and details of tests 6.6.3*, by applying a low surface tension liquid to one side of a compartment boundary. When no liquid is detected on the opposite side of the boundary after expiration of a ~~definite~~ defined period of time, the verification of tightness of the compartment's boundary may be assumed. A developer solution may be applied on the other side of the weld to aid leak detection.

6.8 Safe access to joints

(Part only shown)

Table 3.6.1 Testing requirements

Item to be tested	Testing procedure	Test requirement
~~Ballast hold of bulk carriers~~	~~Leak & structural~~	~~The greater of:~~ ~~• head of water up to the top of the overflow~~ ~~• head of water up to the top of cargo hatch coaming~~
Fore peak voids	Leak and structural	Head of water up to the bulkhead deck, *see* Note 8
Watertight doors below freeboard or bulkhead deck	Leak	*See* Notes ~~5 &~~ 6 & 12
Weathertight doors, hatch covers and closing appliances	Leak	*See* Note 5
Lube oil sump tanks and other similar tanks/spaces under main engines	Leak	*See* Note 5
Chemical ~~tanker cargo~~ tanks	Leak & structural	The greater of: • head of water 2,4 m above top of tank, *see* Note 2 • head of water up to top of tank, *see* Note 2, plus setting of fitted pressure-relief valve

NOTES

1. Including tanks arranged in accordance with the provisions of SOLAS Reg. II-1/*Regulation 9 - Double bottoms in passenger ships and cargo ships other than tankers*.

2. Top of tank is the deck forming the top of the tank, excluding any hatchways. In holds for liquid cargo or ballast with large hatch openings, the top of tank is to be taken to the top of the hatch.

3. Including duct keels and dry compartments arranged in accordance with the provisions of SOLAS Reg. II-1/*Regulation 9 - Double bottoms in passenger ships and cargo ships other than tankers* and Reg. II-1/11.2, as well as voids used for the protection of fuel oil tanks and pump rooms arranged in accordance with the provisions of MARPOL Annex I, Reg. 12A and Reg. 22.

4. Testing of the aft peak is to be carried out after the sterntube has been fitted.

5. A hose test will be considered, *see Pt 4, Ch 3, 6.5 Leak test procedures 6.5.2* and *Pt 4, Ch 3, 6.6 Definitions and details of tests 6.6.3.*

6. Watertight doors not confirmed watertight by a prototype test are to be subject to a hydrostatic test, *see* SOLAS Reg. II-1/*Regulation 16 - Construction and initial tests of watertight doors, sidescuttles, etc*.~~.~~

7. For shell doors providing watertight closure, watertightness is to be demonstrated through prototype testing before installation. The testing procedure is to be agreed with LR prior to testing.

8. Where demonstrated to be impracticable, the structural testing of fore peak void spaces may be exempted subject to the agreement of the attending Surveyor.

9. Where a cargo tank is designed for the carriage of cargoes with a specific gravity greater than 1,0, an appropriate additional head is to be considered.

10. Where air vents are fitted below the top of the coaming, adequate blanking off of these vents may be required prior to the commencement of the test.

11 ~~8~~. Other testing methods listed in *Pt 4, Ch 3, 6.6 Definitions and details of tests 6.6.7* and *Pt 4, Ch 3, 6.6 Definitions and details of tests 6.6.8* may be considered, subject to adequacy of such testing methods being verified, *see* SOLAS Reg. II-1*Regulation 11 - Initial testing of watertight*

bulkheads, etc.

12. All watertight doors are to be hose tested after installation. Hose testing is to be carried out from each side of a door unless, for a specific application, flooding is anticipated from only one side. Where a hose test is not practicable because of possible damage to machinery, electrical equipment insulation or outfitting items, it may be replaced by an ultrasonic leak test or an equivalent test.

Part 4, Chapter 5
Primary Hull Strength

■ *Section 5*
Fatigue design

5.1 General

5.1.1 For the purposes of these Rules, the definitions of environmental terms, e.g. squall and cyclone, given in ‘ISO 19901-1, Specific Requirements for Offshore Structures - Part 1 Metocean design and operating considerations' apply.

Existing paragraphs 5.1.1 to 5.1.4 have been renumbered 5.1.2 to 5.1.5.

~~5.1.5~~ 5.1.6 The following important sources of cyclic loading should be considered in the design:
- Waves (including those which cause slamming and variable-buoyancy effects).
- Wind (especially when vortex shedding is induced, e.g.~~,~~ on slender members).
- Currents (where these influence the forces generated by waves and/or induced vortex shedding).
- Mechanical vibration (e.g.~~,~~ caused by operation of machinery).
- Temperature (thermal cycles) for areas of significant temperature variation.
- Gravity and functional loads (e.g. caused by loading and unloading, and lifting operations).

For sites susceptible to cyclones, the fatigue design of units which remain on-station during cyclones is to include cyclic loading from both the cyclonic and non-cyclonic environments.

Existing paragraphs 5.1.6 and 5.1.7 have been renumbered 5.1.7 and 5.1.8.

5.1.9 Fatigue damage due to lifting operations is to be based on an estimate of the profile of lifts when in operation.

5.2 Fatigue life assessment

(Part only shown)
5.2.1 Fatigue life assessment of all relevant structural elements is required to demonstrate that structural connections have a fatigue endurance consistent with the planned life of the unit and compliance with the minimum requirements. The following structural elements are to be included:
(e) General: Hull, deck and supporting structure in way of topside facilities, e.g.~~.~~:
  - Module support.
  - Process plant support stools.
  - Crane pedestals and boom rests.
  - Flare structures.
  - Offloading station.
  - Drilling derrick and substructures.
  - Structure supporting pipe-laying systems.

5.4 Joint classifications, ~~and~~ S-N curves and fatigue life improvement methods

5.4.10 The following fatigue life improvement methods are acceptable to LR:
(a) Weld geometry control and defect removal:
  (i) Machining, e.g. grinding;
  (ii) Re-melting, i.e. TIG dressing;
  (iii) Weld profile control, i.e. enhanced workmanship.
(b) Residual stress improvement:
  (i) Peening;
  (ii) Thermal stress relief.

Where it is proposed to use any of these methods, a procedure detailing the method is to be submitted to LR for approval prior to commencement of work, and is to be referenced or included directly on the applicable structural and fabrication drawings. The procedure and associated increase in fatigue life are to be in accordance with Chapter 2 of the *ShipRight Fatigue Design Assessment Level 1 Procedure, 2009*. Where toe grinding is used to improve the fatigue life of a fillet welded connection, the weld throat thickness after grinding is not to be less than that required by *Pt 4, Ch 8, 2 Welding*. All work is to be carried out to the satisfaction of an attending

LR Surveyor. Corrosion pitting of the ground/peened metal surface can remove the benefit of grinding/peening. Therefore, the ground/peened surface must be adequately protected against corrosion, e.g. by means of a suitable paint system.

Part 4, Chapter 6
Local Strength

■ *Section 9*
Superstructures and deck-houses

9.1 General

9.1.2 Erections are to comply with
~~• *Pt 10 Ship Units* for ship units.~~
• *Pt 4, Ch 4 Structural Unit Types* for ~~other~~ surface-type units other than ship units.
• This Section for other unit types.
~~Units with a Rule length, L, greater than 150 m will be specially considered.~~

9.3 Definition of tiers

9.3.2 For ship units and self-elevating units where the freeboard corresponding to the required summer moulded draught for the unit can be obtained by considering the unit to have a virtual moulded depth of at least one standard superstructure height less than the Rule depth, *D*, measured to the uppermost continuous deck, proposals to treat the first tier erection as a second tier, and so on, will be specially considered. The standard height of superstructure is the height defined in the *International Convention on Load Lines*, 1966.

Part 4, Chapter 8
Welding and Structural Details

■ *Section 2*
Welding

2.3 Workmanship and inspection

(Part only shown)

Table 8.2.1 Additional non-destructive examination of welds on surface type units (as applicable)

Recommended extent of testing, *see* Note 1 General, *see* Notes 8 and 9		
Structural item	Local	Checkpoints, see Note 1
Flare stack, crane pedestals and boom rests, and integration structure of heavy-lift cranes with the hull. ~~and crane pedestal structure~~	Throughout	100% ~~50%~~, *see* Notes 4 and 5

(Part only shown)

Table 8.2.2 Non-destructive examination of welds on column-stabilised and self-elevating units

Recommended extent of testing, *see* Note 9 General, *see* Note 1		
Structural item	Volumetric checkpoints	Magnetic particle checkpoints
Flare stack, crane pedestals and boom rests, integration structure of heavy-lift cranes with the hull, and gusset connections to deck	100%	100%

Part 4, Chapter 9
Anchoring and Towing Equipment

■ *Section 1*
Anchoring equipment

1.5 High holding power anchors

1.5.1 Anchors of designs for which approval is sought as high holding power anchors are to be tested at sea to show that they have holding powers of at least twice those of approved standard stockless anchors of the same mass. For holding power test requirements relating to high holding power anchors, *see Ch 10, 1.3 Anchor holding power tests for HHP and SHHP anchors* of the Rules for Materials.

~~1.5.2 If approval is sought for a range of sizes, then at least two sizes are to be tested. The smaller of the two anchors is to have a mass not less than one tenth of that of the larger anchor, and the larger of the two anchors tested is to have a mass not less than one tenth of that of the largest anchor for which approval is sought.~~

~~1.5.3 The tests are to be conducted on not less than three different types of bottom, which should normally be soft mud or silt, sand or gravel, and hard clay or similarly compacted material.~~

~~1.5.4 The test should normally be carried out from a tug, and the pull measured by dynamometer or derived from recently verified curves of tug rev/min against bollard pull. A scope of 10 is recommended for the anchor cable, which may be wire rope for this test, but in no case should a scope of less than six be used. The same scope is to be used for the anchor for which approval is sought and the anchor that is being used for comparison purposes.~~

~~1.5.5~~ 1.5.2 High holding power anchors are to be of a design that will ensure that the anchors will take effective hold of the sea bed without undue delay and will remain stable, for holding forces up to those required by *Pt 4, Ch 9, 1.5 High holding power anchors 1.5.1*, irrespective of the angle or position at which they first settle on the sea bed when dropped from a normal type of hawse pipe. In case of doubt, a demonstration of these abilities may be required. The anchors are not to require prior adjustment or special placement on the sea bottom.

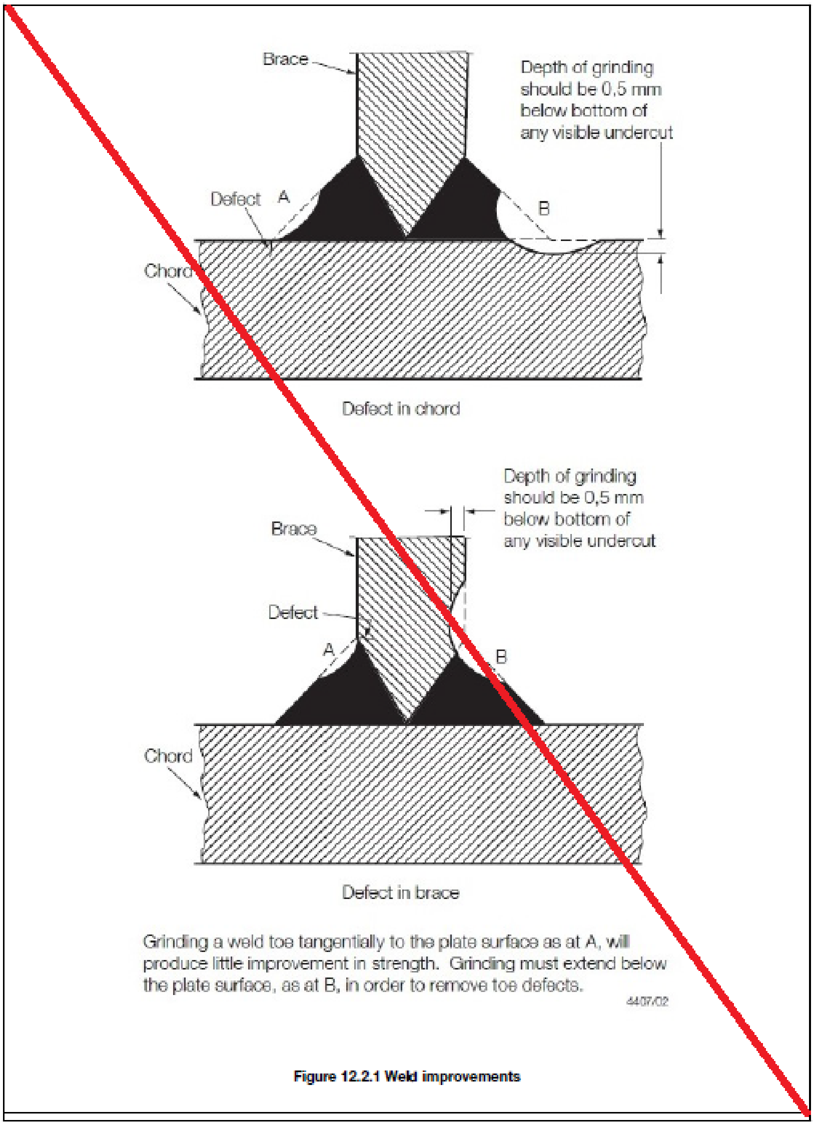
Part 4, Chapter 12
Fatigue – S-N Curves, Joint Classification and Stress Concentration Factors

■ *Section 2*
Fatigue design S-N curves

2.2 Modifications to basic S-N curves

~~2.2.4 **Weld improvement**. For welded joints involving potential fatigue cracking from the weld toe, an improvement in strength by at least 30 per cent, equivalent to a factor of 2,2 on life, can be obtained by controlled local machining or grinding of the weld toe. This is to be carried out either with a rotary burr or by disc grinding. The treatment should produce a smooth concave profile at the weld toe with the depth of the depression penetrating into the plate surface to at least 0,5 mm below the bottom of any visible undercut, *see Pt 4, Ch 12, 2.2 Modifications to basic S-N curves 2.2.5*, and ensuring that no exposed defects remain. The maximum depth of local machining or grinding is not to exceed 2 mm or five per cent of the plate thickness. In the case of a multi-pass weld more than one weld toe may need to be dressed. Where toe grinding is used to improve the fatigue life of fillet welded connections, care should be taken to ensure that the required throat size is maintained. The benefit of grinding is only applicable for welded joints which are adequately protected from sea-water corrosion. Any credit for other beneficial treatments should be justified. It is recommended that no advantage for toe grinding should be taken at the initial design stage. Overall weld profiling is preferred but no improvement in fatigue strength can be allowed unless accompanied by toe grinding. In the case of partial penetration welds, where failure may occur from the weld root, grinding of the weld toe cannot be relied upon to give an increase in strength.~~

~~2.2.5 Special consideration will be given to alternative techniques intended to improve weld quality. Detailed proposals are to be submitted.~~



Grinding a weld toe tangentially to the plate surface as at A, will produce little improvement in strength. Grinding must extend below the plate surface, as at B, in order to remove toe defects.

Figure 12.2.1 Weld improvements

~~**Figure 12.2.1 Weld improvements**~~

Existing Figures 12.2.2 to 12.2.4 have been renumbered 12.2.1 to 12.2.3.

■ *Section 4*
Stress concentration factors

4.1 General

4.1.7 ~~Linear extrapolation over reference points at 0,5 and 1,5 x plate thickness away from the point of interest (normally the weld toe) may be made to determine the geometric hot spot stress.~~ The geometric hot spot stress is to be determined at 0,5 x plate thickness away from the point of interest (normally the discontinuity).

Part 5, Chapter 1
General Requirements for the Design and Construction of Machinery

■ *Section 4*
Trials

4.2 Sea trials

(Part only shown)
4.2.2 The trials are to include demonstrations of the following:
(c) The ability to permit astern running at 70 per cent of the full power ahead revolutions corresponding to the maximum continuous ahead power for which the vessel is classed.
~~(c)~~(d) In steam turbine installations, the ability to permit astern running at 70 per cent of the ~~full power~~ ahead revolutions corresponding to the maximum continuous ahead power for which the vessel is classed ~~without adverse effects~~. This astern trial need only be of 15 minutes' duration, but may be extended to 30 minutes at the Surveyor's discretion.

4.2.3 Main propulsion systems are to undergo tests to demonstrate the astern response characteristics. The tests are to be carried out over at least the manoeuvring range of the propulsion system and from all control positions. A test plan is to be provided by the yard and accepted by the Surveyor. If specific operational characteristics have been defined by the manufacturer, then these are to be included in the test plan.

4.2.4 The reversing characteristics of the propulsion plant, including the blade pitch control system of controllable pitch propellers, are to be demonstrated and recorded during trials.

Existing paragraphs 4.2.3 to 4.2.7 have been renumbered 4.2.5 to 4.2.9.

4.2.10 For main propulsion systems with reversing gears, controllable pitch propellers or electric propeller drive, running astern is not to lead to the overload of propulsion machinery.

Existing paragraph 4.2.8 has been renumbered 4.2.11.

Part 5, Chapter 13
Bilge and Ballast Piping Systems

■ *Section 5*
Ballast system

5.6 Ballast water treatment

5.6.1 Ballast water treatment systems are to comply with *Pt 5, Ch 25 Ballast Water Treatment System and Installation*.

5.6.2 Where it is intended to operate the ballast system bypassing the ballast water treatment system (e.g. lifting operations which take in and discharge at the same location before repeating at another location), compliance with Part 5, Chapter 25, 1.1.3 is required.

5.7 Ballast pipe supports and foundations of ballast pumps

5.7.1 Where ballast systems designed for rapid filling/discharge use either piston valves and/or pump ratings without proven service history, the strength of ballast pipe supports and the foundations of the ballast pumps are to be assessed against the forces and moments at the pipe supports and pump flanges for the load combinations defined in *Pt 4, Ch 4, 4.3 Load conditions 4.3.1*. The permissible stresses are to comply with *Table 5.2.1 Factors of safety*.

Part 5, Chapter 23
Jacking Gear Machinery

■ *Section 3*
Design

3.9 Fatigue

3.9.1 Fatigue damage due to cyclic loading is to be considered in the design of the jacking gear machinery and is to be based on an estimate of the load profile when in operation. The load profile is to consider all stages of jacking including:
(a) Raising and lowering the legs with the hull afloat.

(b) Raising and lowering the hull with the legs in contact with the sea bed.
(c) Preloading.

Part 5, Chapter ~~24~~ 26
Fresh Water Systems

■ *Section 1*
General requirements

1.1 Definitions

1.1.1 For the purpose of this Chapter, the following definitions apply:

(a) **Fresh water** – Water that is not salty and is used on board offshore units. Fresh water may be supplied to the offshore unit or be produced on board by the desalination of sea water. The density of fresh water is to be taken as 1000 kg/m^3.

(b) **Potable water** – Drinkable water that meets the water quality defined in a recognised National or International Standard which is to be specified by the Owner and agreed by LR and is designated for drinking, domestic services and food preparation, e.g. the World Health Organisation's *Guidelines for Drinking Water Quality* or Seahealth Denmark - *Drinking Water On Board Ships - A guidance about how to provide clean drinking water* or *Water Report 129 – Safe, Sufficient and Good Potable Water Offshore* by the Norwegian Institute of Public Health ~~and is designated for drinking, domestic services and food preparation~~. Potable water is obtained by the sterilisation of fresh water.

1.4 Documentation required for design review

(Part only shown)

1.4.2 The following documents are to be submitted for approval.

(b) **Testing ~~and trials~~ procedures**

These are procedures detailing a schedule of testing ~~and trials~~ to demonstrate that systems are capable of operating as described in *Pt 5, Ch ~~24~~26, Section 3 System arrangements* and as required by *Pt 5, Ch ~~24~~26, Section 5 Testing ~~and trials~~*.

■ *Section 2*
Equipment and components

2.6 Pumps

2.6.1 Pumps are to be capable of operating satisfactorily under the conditions shown in *Pt 5, Ch 1, 2 Operating conditions*. The selection of pumps is to consider:
(a) Pump characteristic and required duty.
(b) Performance if required to perform a secondary duty.
(c) Pumped fluid and its temperature ranges.
(d) Maximum discharge pressure head from the pump and design pressure of piping system.
(e) The size of air pipes and capacity of air pipe heads fitted to tanks which can be pumped up.
(f) The need to fit relief devices to pumps and piping systems.
(g) Maximum permissible fluid velocities in the piping system to avoid erosion and damage to valve seats and other fittings, *see also Pt 5, Ch 12, 11.6 Water velocity* of the Rules for Ships.
(h) Minimum fluid velocities to avoid fouling and subsequent pitting, *see also Pt 5, Ch 12, 11.6 Water velocity* of the Rules for Ships.

■ *Section 3*
System arrangements

3.2 Sea ~~Water~~ water desalination plants

3.2.1 Installed sea water desalination plants are to be capable of producing fresh water~~, as a minimum, to the quality defined in the World Health Organisation's *Guidelines for Drinking Water Quality*~~. A more stringent quality of water production may be necessary in the case of water for use in, for example, boiler feed systems. In these cases, an alternative means of fresh water production is to be provided or a further stage of desalination included in the production arrangements. ~~Where the specified quality for fresh water is different to that of the World Health Organisation, details to be provided to LR.~~

3.3 Piping system design

3.3.5 Pressure relief devices, if required, are to be mounted in such a way that it is not possible to isolate them from the part of the system which they are protecting except that, where duplicated, a changeover valve may be fitted that will enable either device to be isolated for maintenance purposes without it being possible to shut off the other device at the same time.

3.4 Piping system distribution

3.4.6 There are to be no permanent connections between fresh water and sea water systems. Where emergency connections have been designed for the supply of fresh water to fresh and sea water cooled equipment, the fresh water is to be supplied by means of a portable hose with screw down non-return valve isolation or equivalent arrangements at the connection to the equipment.

■ *Section 5*
Testing ~~and trials~~

5.1 General ~~Testing~~

5.1.5 Fresh water systems for potable water are to be cleaned and sterilised after testing in accordance with equipment manufacturer's installation instructions and a recognised National or International Standard e.g. BS 7593 *Code of practice for treatment of water in domestic hot water central heating systems*. The quality of potable water is subsequently to be tested by an accredited laboratory to confirm that the water quality meets that defined in ~~the World Health Organisation's *Guidelines for Drinking Water Quality*~~ *Pt 5, Ch 26, 1.1 Definitions 1.1.1(b)*. Separate water samples are to be taken from the outlet of the sea water desalination plant and at an outlet from the potable water storage tank using water which has been in the tank for not less than 24 hours.

Existing sub-Section 5.3 has been deleted in its entirety.

Part 5, Chapter 25
Ballast Water Treatment System and Installation

■ *Section 1*
General

1.1 Application

1.1.1 Requirements for ballast water treatment systems and their installation, where fitted, are given in *Pt 5, Ch 25 Ballast Water Treatment System and Installation* of the Rules for Ships, which are to be complied with except where otherwise stated.

1.1.2 Additional requirements with respect to unit types as indicated in this Chapter are also to be complied with, as applicable.

1.1.3 Where it is intended to operate the ballast system bypassing the ballast water treatment system (e.g. lifting operations of heavy-lift crane units which take in and discharge at the same location before repeating at another location), a risk assessment is to be carried out in accordance with IMO Resolution MEPC.162(56) - *Guidelines for Risk Assessment under Regulation A-4 of the BWM Convention*. Where ballast systems and tanks which bypass ballast water treatment systems are required to be cleaned between operations, these are to be identified on the plans and their cleaning procedures are to be included in the Operations Manual.

■ *Section 8*
Structural idealisation

8.8 Load calculation point for the determination of scantlings of plate panels for scantling requirements

8.8.1 Scantlings of plate strakes are to be derived based on the idealisation of the as-built structure as a series of elementary plate panels (EPPs).

8.8.2 An EPP is the unstiffened part of the plating between stiffeners. The plate panel length, l_{epp}, and breadth, s_{epp}, of the EPP are defined in relation to the longest and shortest plate edges respectively, as shown in *Figure 1.8.8 Elementary plate panel definition.*

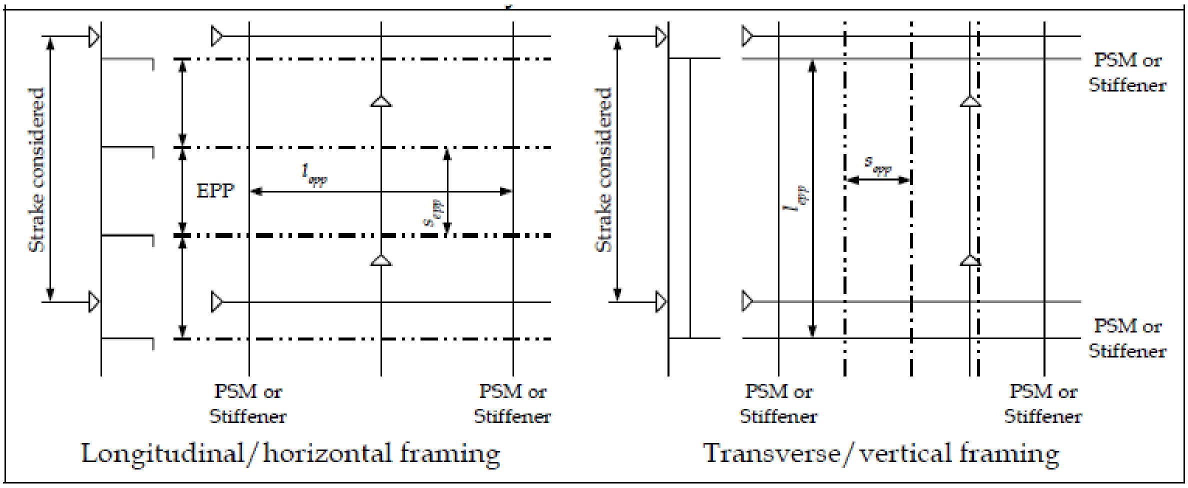


Figure 1.8.8 Elementary plate panel definition

8.8.3 The required scantling of each EPP is to be calculated based on a load calculation point (LCP) defined as:

(a) for longitudinal framing, at the mid-length of the EPP measured along the global x-axis at its lower edge. For horizontal plating the LCP is to be taken at the outboard y-value of the EPP. *See Figure 1.8.9 Example of load calculation points for typical structural configurations – longitudinal framing*;

(b) for transverse framing, at the mid-length of the EPP measured along the global x-axis at the lower edge of strake. For horizontal plating the LCP is to be taken at the outboard y-value of the EPP. *See Figure 1.8.10 Example of load calculation points for typical structural configurations – transverse framing*;

(c) for horizontal framing on vertical transverse structure, at the lower edge of the EPP at the point of outboard y-value of the EPP. *See Figure 1.8.11 Example of load calculation points for typical structural configurations – horizontal framing on transverse structure*;

(d) for vertical framing on vertical transverse structure, at the greatest y-value of the lower edge of the EPP or at the lower edge of strake. *See Figure 1.8.12 Example of load calculation points for typical structural configurations – vertical framing on transverse structure*.

8.8.4 Both the local pressure and hull girder stress used for the calculation of the local scantling requirements are to be taken at the LCP.

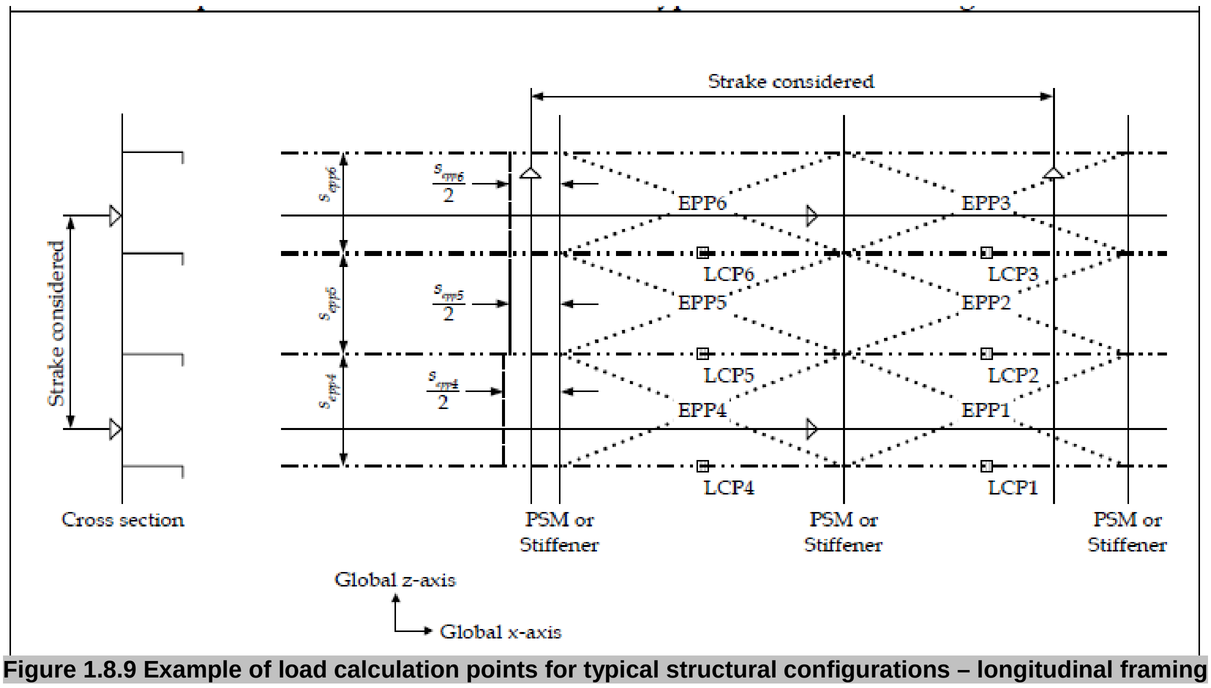


Figure 1.8.9 Example of load calculation points for typical structural configurations – longitudinal framing

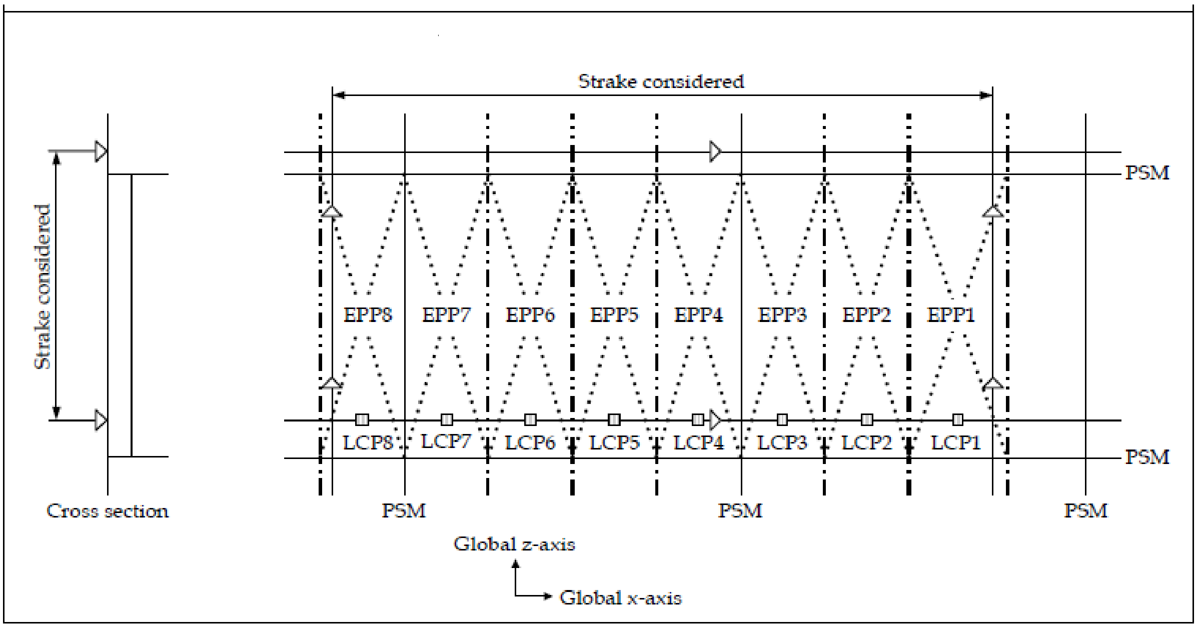


Figure 1.8.10 Example of load calculation points for typical structural configurations – transverse framing

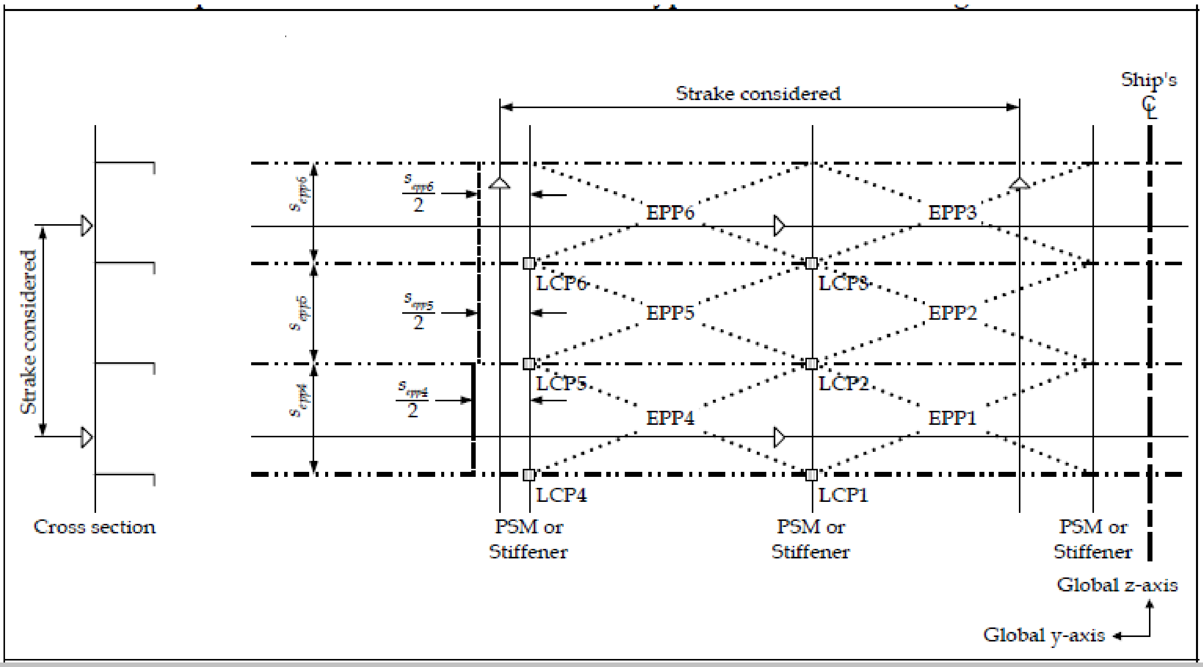


Figure 1.8.11 Example of load calculation points for typical structural configurations – horizontal framing on transverse structure

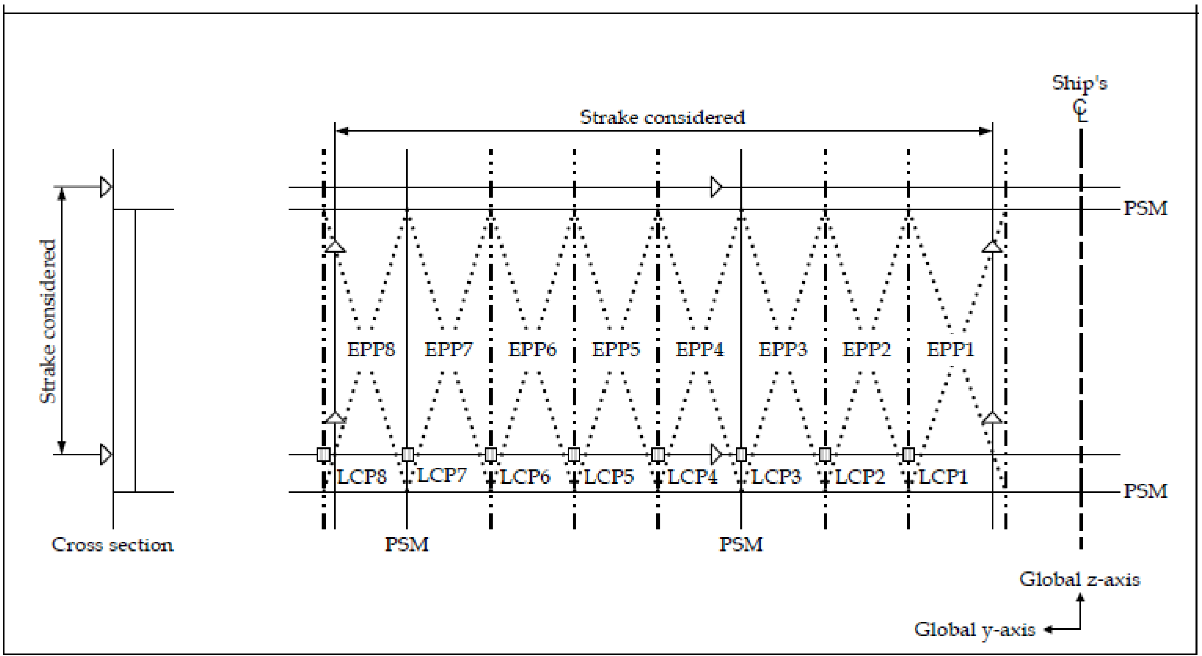


Figure 1.8.12 Example of load calculation points for typical structural configurations – vertical framing on transverse structure

8.9 Load calculation point for the determination of scantlings of plate panels for hull girder strength

8.9.1 The required scantlings of the EPPs are to satisfy the hull girder bending and hull girder shear requirements of *Pt 10, Ch 3 Scantling Requirements*.

8.9.2 The required thickness of each EPP, with respect to buckling, is to be calculated based on stresses taken at the mid-length of the EPP measured along the global x-axis.

8.9.3 The buckling evaluation is to be calculated using the stress distribution across the width of the panel defined with a reference stress taken at the edge with maximum stress and reduced stress at the other edge given as a fraction, ψ, defined in *Table 1.18.1 Buckling factor and reduction factor for plane plate panels*, of the reference stress.

■ *Section 10*
Topside structure

10.1 General

10.1.1 The minimum scantlings of superstructures and deck-houses are to comply with the requirements of ~~*Pt 3, Ch 8 Superstructures, Deckhouses and Bulwarks* of the Rules for Ships.~~ *Pt 4, Ch 6, 9 Superstructures and deck-houses*. Corrosion additions, determined in accordance with *Pt 10, Ch 1, 12 Corrosion additions*, are to be added to these scantlings. Bulwarks and guard-rails are to comply with *Pt 4, Ch 6, 10 Bulwarks and other means for the protection of crew and other personnel* but special consideration is to be given to the scantlings of bulwarks at the fore end or screens protecting the swivel stack. In general, the scantlings of bulwarks at the fore end are not to be less than required for deck-house fronts at the position under consideration.

Part 10, Chapter 3
Scantling Requirements

■ *Section 1*
Scantling requirements

1.8 Termination of local support members

(Part only shown)

1.8.6 **Air and drain holes and scallops**.

(a) Air~~,~~ and drain holes~~,~~ and scallops ~~and block fabrication butts~~ are to be kept at least 200 mm clear of the toes of end brackets, end connections and other areas of high stress concentration measured along the length of the stiffener toward the midspan and 50 mm measured along the length in the opposite direction, *see Figure 3.1.10 Location of air and drain holes*. Openings that have been fitted with closing plates, such as scallops, may be permitted in way of block fabrication butts. In areas where the shear stress is less than 60 per cent of the allowable limit, alternative arrangements may be accepted. Openings are to be well-rounded. *Figure 3.1.9 Examples of air and drain holes and scallops* shows some examples of air and drain holes and scallops. In general, the ratio of a/b, as defined in *Figure 3.1.9 Examples of air and drain holes and scallops*, is to be between 0,5 and 1,0. In fatigue-sensitive areas, further consideration may be required with respect to the details and arrangements of openings and scallops.

■ *Section 2*
Cargo tank region

2.3 Hull envelope plating

(Part only shown)

2.3.3 **Bilge plating.**

(c) Where bilge longitudinals are omitted, the bilge plate thickness outside 0,4L amidships will be considered in relation to the support derived from the hull form and internal stiffening arrangements. In general, outside 0,4L amidships the bilge plate scantlings and arrangement are to comply with the requirements of ordinary side or bottom shell plating in the same region. Consideration is to be given where there is increased loading in the forward region, *see also Pt 10, Ch 3, 6.4 Bottom and bilge slamming 6.4.9*.

■ *Section 6*
Evaluation of structure for sloshing and impact loads

6.4 Bottom and bilge slamming

6.4.1 **Application.**

(Part only shown)

(a) Where the minimum draughts forward, $T_{\text{FP-mt}}$ or $T_{\text{FP-full}}$, as specified in *Pt 10, Ch 2, Loads and Load Combinations*, is less than 0,045L, the bottom and bilge forward ~~is~~ are to be additionally strengthened to resist ~~bottom~~ slamming pressures.

(b) For self-propelling units with conventional single screw, ship-type aft sections, additional strengthening against aft slamming will not normally be required. For units with full deep aft sections, strengthening to resist bottom and bilge slamming should be applied over 0,3L aft, using the requirements of *Pt 10, Ch 3, 6.4 Bottom and bilge slamming 6.4.3* and *Pt 10, Ch 3, 6.4 Bottom and bilge slamming 6.4.4* and the applicable draughts aft, $T_{\text{AP-mt}}$ or $T_{\text{AP-full}}$, where less than 0,045L. Units with raised or unusual sections aft that may be susceptible to slamming will be specially considered, using the requirements of *Pt 4, Ch 2, 4.3 Strengthening for wave impact loads* and *Pt 4, Ch 2, 5.2 Strengthening for wave impact loads* of the Rules for Ships.

(c) The draughts for which the bottom and bilge have ~~has~~ been strengthened are to be indicated on the shell expansion plan and loading guidance information, *see Pt 10, Ch 3, 1.2 Loading guidance*.

(d) The section modulus and web thickness of the local support members apply to the areas clear of the end brackets. The cross-sectional shear areas of primary support members are to be applied as required by *Pt 10, Ch 3, 6.4 Bottom and bilge slamming 6.4.7.(c)* and *Pt 10, 6.4 Bottom and bilge slamming 6.4.7.(d)*.

(e) For harsh service, special consideration should be given to strengthening of bottom and bilge forward in relation to the actual forces determined from model tests and/or direct calculations.

6.4.2 Extent of strengthening.

(a) The strengthening of the forward end is to extend forward of 0,3L from the F.P. over the flat of bottom, bilge and adjacent plating with attached stiffeners up to a height of 500 mm above the baseline, *see Figure 3.6.1 Extent of strengthening of the forward end against bottom and bilge slamming*.

(b) Where strengthening of the aft end is required, this is to extend aft of 0,3L from the A.P. over the flat of bottom, bilge and adjacent plating with attached stiffeners up to a height of 500 mm above the baseline, *see Figure 3.6.2 Extent of strengthening of the aft end against bottom and bilge slamming*.

(c) ~~(b)~~ Outside the region strengthened to resist bottom and bilge slamming, the scantlings are to be tapered to maintain continuity of longitudinal and/or transverse strength.

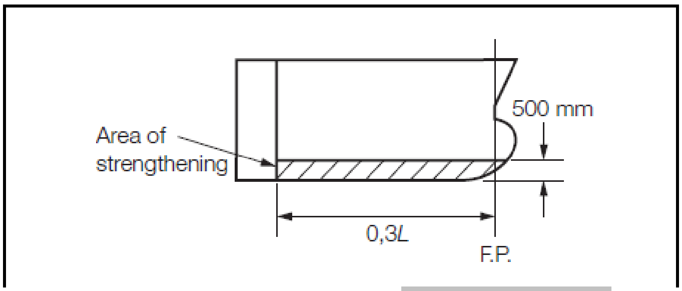


Figure 3.6.1 Extent of strengthening of the forward end against bottom and bilge slamming

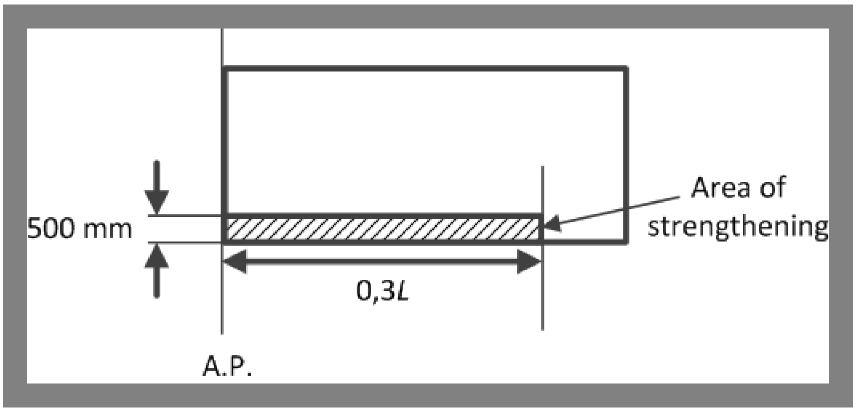


Figure 3.6.2 Extent of strengthening of the aft end against bottom and bilge slamming

Existing Figures 3.6.2 and 3.6.3 have been renumbered Figures 3.6.3 and 3.6.4.

6.4.9 Bilge plating.

(a) The thickness of bilge plating is not to be less than that required for the adjacent bottom shell, *see Pt 10, Ch 3, 6.4 Bottom and bilge slamming 6.4.4*.

(b) The net thickness of bilge plating, t_{net}, without longitudinal stiffening is not to be less than:

$$t_{net} = \frac{\sqrt[3]{r^2 S_t P_{slm}}}{100 C_d} \text{ mm}$$

where

P_{slm} = slamming pressure as given in *Pt 10, Ch 2, 4.2 Bottom and bilge slamming loads 4.2.2* and calculated at the lower turn of bilge, in kN/m^2
r, S_t, a and b are as defined in *Pt 10, Ch 3, 2.3 Hull envelope plating 2.3.3*
C_d is as defined in *Pt 10, Ch 3, 6.4 Bottom and bilge slamming 6.4.4(a)*

Where the plate seam is located in the flat plate just below the lowest stiffener on the side shell, any increased thickness required for the bilge plating does not have to extend to the adjacent plate above the bilge, provided that the plate seam is not more than S_b/4 below the lowest side longitudinal. Similarly, for flat part of adjacent bottom plating, any increased thickness for the bilge plating does not have to be applied, provided that the plate seam is not more than S_a/4 beyond the outboard bottom longitudinal. Regularly longitudinally-stiffened bilge plating is to be assessed as a stiffened plate. The bilge keel is not considered as ‘longitudinal stiffening’ for the application of this requirement.

Part 11, Chapter 8
Vent Systems for Cargo Containment

■ *Section 1*
Vent Systems for Cargo Containment

1.4 Sizing of pressure relieving system

(Part only shown)

1.4.1 **Sizing of pressure relief valves**

PRVs shall have a combined relieving capacity for each cargo tank to discharge the greater of the following, with not more than a 20 per cent rise in cargo tank pressure above the MARVS:

The gas factor of each cargo to be carried shall be determined and the highest value shall be used for PRV sizing.

A = external surface area of the tank (m^2) for different tank types, as shown in *Figure 8.1.1 Horizontal cylindrical tanks arrangement*:

For prismatic tanks L_{min}, and the associated external surface area of the tank, *A,* are to be taken as follows:

- L_{min}, for non-tapered tanks, is the lesser of the longitudinal or transverse horizontal dimensions of the bottom of the tank. The bottom of the tank is to be regarded as the flat portion only not including the lower chamfered sides.
- For tapered tanks, as would be used for the forward tank, L_{min} is the lesser of the length and the average width of the bottom of the tank.
- For prismatic tanks whose distance between the bottom of the tank and bottom of the hold space is equal to or less than $L_{min}/10$:
  A = external surface area minus the bottom surface area of the tank.
- For prismatic tanks whose distance between the bottom of the tank and bottom of the hold space is greater than $L_{min}/10$:
  A = external surface area.

Part 12, Chapter 1
Recognised Codes and Standards

■ *Section 8*
Compressed gas utility systems

8.1 Recognised codes and standards for compressed gas utility systems

8.1.1 The following Codes and Standards are recognised by LR:

ANSI/ASME A13.1 Scheme for the Identification of Piping Systems
BCGA Guidance Note GN2 Guidance for the storage of gas cylinders in the workplace.
BCGA Code of practice CP7 The safe use of oxy-fuel gas equipment (individual portable or mobile cylinder supply).
BCGA Guidance Note GN11 Reduced oxygen atmospheres.
BS EN 730-1 Gas welding equipment. Safety devices. Incorporating a flame (flashback) arrestor.
BS EN 1089-3 Transportable gas cylinders. Gas cylinder identification (excluding LPG). Colour coding.
BS EN ISO 7225 Gas cylinders. Precautionary labels.
BS EN ISO 7291 Gas welding equipment. Pressure regulators for manifold systems used in welding, cutting and allied processes up to 300 bar.
BS 1710 Specification for identification of pipelines and services.
NFPA 51 ~~Standard for the~~ Design and Installation of Oxygen - Fuel Gas Systems for Welding, Cutting, and Allied Processes.
NFPA 55 Compressed Gases and Cryogenic Fluids Code.
ISO 2503 Gas welding equipment -- Pressure regulators and pressure regulators with flow-metering devices for gas cylinders used in welding, cutting and allied processes up to 300 bar (30 MPa).
ISO 9090 Gas tightness of equipment for gas welding and allied processes.
ISO 9539 Gas welding equipment -- Materials for equipment used in gas welding, cutting and allied processes.

ISO 14113 Gas welding equipment -- Rubber and plastics hose and hose assemblies for use with industrial gases up to 450 bar (45 MPa).
ISO 14114 Gas welding equipment -- Acetylene manifold systems for welding, cutting and allied processes -- General requirements.
ISO 14726 Ships and marine technology -- Identification colours for the content of piping systems
~~IMO MODU Code 2009~~.

■ *Section 16*
Electrical welding systems

16.1 Recognised codes and standards for electrical welding systems

16.1.1 The following Codes and Standards are recognised by LR:
BS EN/IEC 60974-1 Arc welding equipment - Part 1: Welding power sources.
BS EN/IEC 60974-7 Arc welding equipment - Part 7: Torches.
BS EN/IEC 60974-9 Arc welding equipment - Part 9: Installation and use.

Existing Sections 16 to 33 have been renumbered 17 to 34.

■ *Section 35*
Safety signage

35.1 Recognised codes and standards for signage

35.1.1 The following Codes and Standards are recognised by LR:
BS EN ISO 7010 Graphical symbols. Safety colours and safety signs. Registered safety signs.
BS ISO 24409-1 Ships and marine technology – design, location and use of shipboard safety signs, safety-related signs, safety notices and safety markings – Part 1: Design principles.
BS EN 82079-1 Preparation of instructions for use. Structuring, content and presentation. General principles and detailed requirements

Existing Sections 34 to 38 have been renumbered 36 to 40.

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